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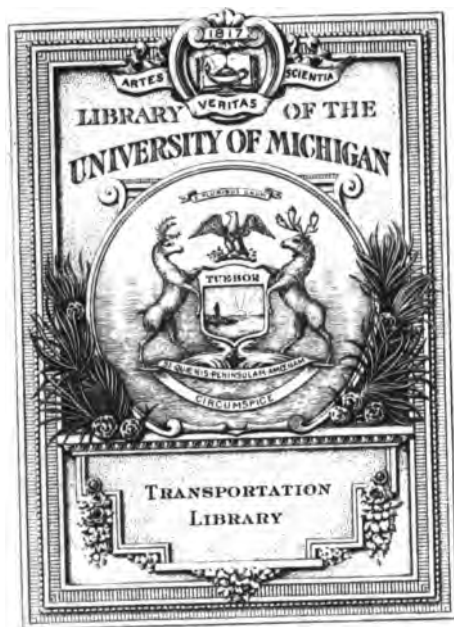
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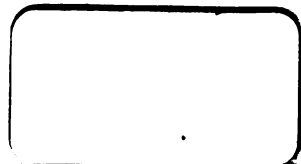
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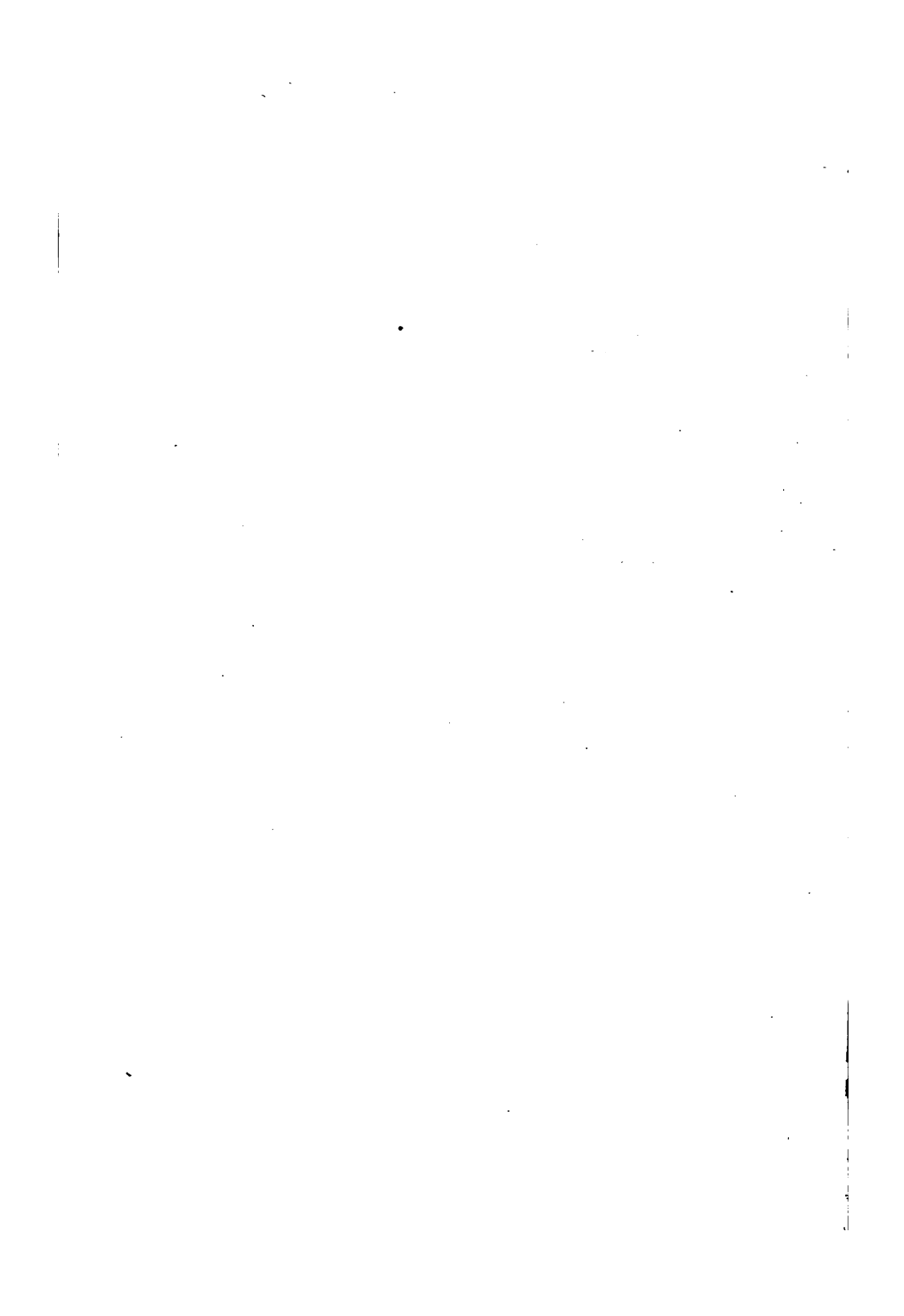


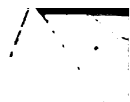
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GOOD ENGINEERING LITERATURE

*What to Read and How to Write
With Suggestive Information on
Allied Topics*

By

HARWOOD FROST

*M. Am. Soc. M. E., M. Soc. Form. Eng. Educ.
Author, "The Art of Roadmaking"
Formerly Editor of "The Engineering Digest"
and Manager, Engineering News Book Department*

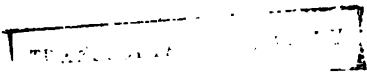
*"Reading maketh a full man, conference a ready man,
and writing an exact man"—Bacon*

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PREFACE

Every book should have a Preface. It opens up the subject with the reader much as the state of the weather opens a conversation between strangers. In the present case, the subject—the making, selecting, and reading of engineering literature—is one on which, up to this time, there has been practically nothing in published form, excepting a few reprints of lectures and occasional periodical articles. A treatment of this important subject has been long needed, and I offer no apologies for the present attempt. But such a work is peculiarly open to criticism and in anticipation of such, I may say that I am already well aware of its many imperfections and faults, both of omission and commission.

The material itself is an elaboration of that given in addresses to engineering students in the early part of 1910, and its presentation in a printed book is the outgrowth of a request that this material be given in a more permanent and useful form than that of oral discourse. When the writing was commenced it was the intention to issue two or three pamphlets only; but as the work progressed, the fact developed that while there is plenty of literature for the

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would-be writer of fiction and magazine stories, there is nothing, except as mentioned above, for the engineer-writer, and the more extensive book was therefore decided upon. No effort has been made to give set rules for the study of English, Grammar, Rhetoric, or any other of the fundamentals of literature, nor to dictate methods as to how a thing **must be done** to be **correctly done**; the effort has been rather to outline principles and to point out their application in what might be termed "literary engineering."

Every engineer is, sooner or later, called upon in the course of his professional duties, to do some form of literary work, when he finds that the ability to speak and write clearly and forcibly, to express his thoughts and understandings and to describe his works so that others will understand them, will prove one of the most valuable items in his mental equipment. This fact is, however, too little appreciated by the average student, or by the engineer during the earlier years of his work and as a result, we see many engineers painfully groping their way and struggling with the difficulties of composition under conditions where success depends on their powers of persuasion or of making themselves clearly understood.

To such practicing engineers, as well as to the student of engineering, it is hoped that

this book will offer a helping hand. Its purpose is fourfold:

1. To impress upon the reader the value and need of a command of good English in the practice of engineering, and to outline the application of the fundamentals of literary expression to his own special line of work.

2. To indicate something of the standards of engineering literature and of the kind of material that is most valuable to the engineer; to show how to collect, select, and arrange this information and prepare it for publication; and to give in outline such information regarding the theory and practice of the publishing business as may assist the writer in the preparation and marketing of his literary works.

3. To aid the engineer in the selection and reading of his professional literature that he may use his time and money to the best advantage.

4. To collect and preserve some of the information given in the writings and addresses of technical men on this subject, which is worthy of preservation, but which is unknown and unattainable to the average student or engineer.

In the use of these writings and addresses, I have been very free and while it would be almost impossible to give separate credit for each quotation or adaptation, in cases where

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much material has been used, I have given individual credit, but besides this, special credit should be given to "Engineering News," from which I have made frequent quotations. I have also consulted encyclopedias and a few other works of a reliable kind, bearing on the general subject, and have used material therefrom as occasion demanded. Thanks are also due to Prof. J. M. Telleen, of the Case School of Applied Science, for his examination of some of the earlier sections of the book and for many valuable suggestions in connection therewith.

In conclusion, while I have derived much pleasure from the preparation of the present book, I realize its defects. It is my desire to improve it and to make it more useful by the experience and suggestions of engineers in practice as well as in teaching. No one man can cover the entire range of any subject in his own experience, therefore I would greatly appreciate any information that could be incorporated in the work and add to its usefulness to the engineer and the student, for whom it is intended.

H. F.

Chicago, Ill., April 15, 1911.

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and instead of rushing into professional studies exclusively, should rather avoid the engrossing influence of what is popularly called "shop." He will soon enough learn to know the cramping influence of purely professional occupation and studies, and if he insists on fixing his mind on these to the entire neglect of general culture, he should be told at once that no professional training, however complete, can teach a man the whole of his profession; that the most exact professional drill will fail to teach him that most interesting and most important part of his business—the part, namely, where the specialty of the profession comes directly into contact with the generality of human notions and human sympathies. Of this the profession of the law furnishes an excellent and perhaps the best example, for while there is no art more technical, more artificial, and more removed from a fellow-feeling of humanity, than law in many of its branches, in others it marches out into the great arena of human rights and liberties, and deals with large questions, in the handling of which it is often of more consequence that the pleader should be a complete man than that he should be a legal expert. In the same way, medicine has as much to do with a knowledge of human nature as with the virtues of skilfully mixed drugs and the revelations of a technical diagnosis. So, also, in the practice of the art, as

Tredgold defined it, "of directing the great sources of power in Nature for the use and convenience of man," the engineer is brought into contact with every advance in civilization, comfort, luxury, and safety of mankind. The life of the engineer is rendered "broader and deeper," through contact with the work and thoughts of his fellowman as reflected in the writings of men prominent in the various departments of study and of his own profession.

"Literature" is a large subject, and it is not my intention, in the present small work, to delve too deeply into its mysteries. But what is "Literature"? Mere bookmaking is not literature. Bibliography, fiction, history, are only so many branches of literature; books and periodicals are only two forms of literature; we speak of the "Literature of Engineering," or of Civil Engineering, or of Cement and Concrete, meaning the entire range of published information on these general or specialized subjects. Thus, "Literature" may be said to be the record, in more or less permanent and readable form, of the results of human thought and activity, considered collectively. The literature of his profession is the most valuable instrument at the command of the engineer, but in the present-day tendency towards specialization and the strong individualizing of the separate departments of the profession, there is always danger of a misuse of this instrument.

If the engineer would not become too much a creature of technicalities and specialties; if he would not build around himself a high wall of exclusiveness, he must not, in his devotion to any one branch of his profession, become careless and neglectful of the progress that is being made in the many other branches, as well as in the general affairs of the world.

The successful engineers of today are most diligent consumers of literature. No matter how many years of practical experience he may have behind him, or to what degree of success he may have attained in his work, the successful man never seems to reach that point where he can afford to do without the aid and instruction offered him through the medium of his books and periodicals. He realizes the need of this contact with the work and thoughts of his fellow men and his brother engineers; he knows that his success does not depend so much upon his own independent thought and work as upon the experience of others, which is recorded for his benefit in the literature of his profession. The importance of this literature to everyone connected with engineering work—practitioner, contractor, instructor, or student—cannot be overestimated. It is absolutely essential to his success; it keeps him out of the ruts, and is not only broadening and deepening, but a constant source of stimulation and inspiration.

I

LITERARY EXPRESSION

The professional engineer is naturally looked upon as an educated man. He is expected to be a man of good address, and conversant with the elements of grammar, spelling, and punctuation, but not necessarily omniscient, or a master of the whole circle of the arts and sciences. There are some men, it is true, of recognized technical ability, who cannot, or do not, use ordinarily good grammar; who use the language of an uneducated laborer, and whose penmanship, spelling, and punctuation would hardly pass an elementary examination; but the fact that a few men of this type, uneducated, ignorant, or merely careless, have risen to such positions and in some cases have attained fame and financial success, does not minimize the importance to the engineer of a command and use of correct English. There is often displayed a tendency among engineering students to master the science of engineering while neglecting the humble details of good rhetorical and grammatical usage, but while there may occasionally arise a genius whose activities are guided by a

sort of divine inspiration rather than by the teachings of experience, the majority of engineers are ordinary mortals with commonplace talents, and ordinary methods must be used in their training. It cannot be too strongly impressed upon the engineer, and the young engineer especially, that deficiency in respect to the above-mentioned elements of education casts suspicion upon the entire range of his learning and upon the value of his professional opinion. I am inclined to think that the average engineering student considers the study of English one of minor importance, which should have been finished in his public school days; that he lacks an appreciation of the purpose of his more advanced English studies and the necessity in his future professional work of correct literary expression.

NEED TO THE ENGINEER OF CORRECT LITERARY EXPRESSION

Literary expression, by which I mean the communication of thought by means of written or spoken language, constitutes a peculiar art. There are some more highly gifted than others with a facility of expression, but correct literary expression is not among the arts that come by nature, and perfection cannot be acquired except by long and continual practice. When learned, good English is just as easily used as bad English, and its use places

one on a high stand in the estimation of all educated people, and certainly does not lower one in the estimation of the uneducated.

There are many advantages in being able to write and speak well. One of the tendencies of class-room study is to make the student absorb a mass of facts by rote, soon to be forgotten, rather than to assimilate the principles for further use. The preparing of compositions, essays, speeches, and debates makes him think over and review his mental stock-in-trade from time to time, and encourages him to add to this stock by reading, listening, asking questions, and thinking. It also gives him active practice in putting his stock-in-trade to some use; otherwise the mass of materials might lie uncultivated, or might, at any rate, be difficult to utilize when needed. Furthermore, the preparing of these literary productions trains the student into the habit of going straight to the point, and in many ways it will be productive of a saving of time and exertion, which will go a long way towards professional success. It also forces the student to give definite shape to his ideas, which in turn cultivates the faculty of speaking well and readily and without nervousness when unexpectedly called upon. For, if he has to divide his attention between the collecting and arranging of ideas and their expression, he

must often express the ideas without shape, illogically, and ungrammatically. •

To the engineer this command of correct language is essential. The practice of correct writing is a necessity from the time he pens his first application for a job to the end of his professional career. It is necessary, not merely for the clear expression of his thoughts in correspondence, but for use in the many other forms of composition which he is continually called upon to write, such as reports, specifications, and contracts; technical articles and descriptions of his works for periodicals and engineering societies, and sometimes the more elaborate productions, such as books and trade publications. The practice of correct speech is necessary in ordinary conversation, in business interviews, in presenting views before committees, in speaking to public bodies, and in arguing with boards of directors. Then also, the young engineer who goes out from one of our technical universities equipped with a wide knowledge of some particular branch of engineering may later be called upon, as an expert, to submit opinions and advice to public gatherings and council-boards, both orally and in writing, where his ability to give clear and concise explanations of some engineering subject will be put to the most merciless test. Power lies in clearness and readiness in giving expression to thoughts, and unless the engineer

is reasonably proficient in both writing and speaking, he will find himself in a difficulty in which no friend or book of rules can help him.

Some features regarding "The Value of English to the Technical Man" were clearly brought out in an address before the Technological Society of Kansas City, by John Lyle Harrington*, an abstract of which may well be quoted in this connection:

* * * The great majority of technical men occupy salaried positions in the organizations of railways, governments, constructing companies, and manufacturing corporations. These positions are obtained by means of acquaintances made in a social way, by interview, by correspondence, or on account of an earned reputation. * * * One who is ignorant of the language finds social progress substantially impossible. This may seem a trivial matter, but it is not. Matters of very large importance are very often settled by favor, and favor frequently follows social position. Other things being equal, almost anyone will show his friend the preference in business or professional matters. Social relations make largely for success or failure in the business or professional world. Many have received the opportunity which led to eminence through the recommendation of a casual acquaintance who was favorably impressed.

In business correspondence the value of good usage is still more manifest than in conversation. The art of letter writing, like a

*Consulting Engineer, Kansas City.

knowledge of grammar, is commonly considered to be within the range of everyone's learning and skill; but anyone who has had large experience in business correspondence knows that few men write good letters. Many men owe the opportunity for advancement to their ability to write a good letter.

The detrimental results of bad English in conversation or in correspondence are by no means so certain as in the more formal technical papers. In the preparation of articles for the technical press, and papers for the learned societies, there is time to study form and style and to eliminate errors due to haste; hence, when such matters are ill written, it is not unfairly argued that the writer is ignorant of the correct use of the language. The idea that a technical paper is dry at best, and that the English employed in it is of small consequence, has long been proved incorrect. There is so much nowadays that is well written that no busy professional man is willing to spare the extra time and effort necessary to read and digest an ill-written paper.

A merchant may advertise his wares, a manufacturer his product, but reasonable modesty and his code of ethics prevent a professional man from advertising his skill. If he does not become known by his work or his writings, he remains in comparative obscurity. His ability is clearly exposed in his writings, in which he gives to the profession his best thought; and if he cannot write easily and well he will probably not write at all, for the censorship of the learned societies is now severe and is rapidly growing more so. Every normal, healthy-minded technical man desires

to leave a permanent record of the results of his best thought and work to aid his co-workers and those that come after him. An ably written description of work performed, discoveries made, or methods developed accomplishes more for the advancement of science than many well designed and well executed constructions. The latter benefit those who see them; the former may help all who can read.

Provoking and expensive errors often arise from the misunderstanding of badly expressed orders, rules, and regulations. In large corporations, especially in railway, contracting, and engineering companies where employees are distributed over a wide area, it is impossible for an officer to give individual instructions, or to see personally that they are carried out; hence, general instructions must be so clear that they cannot be misunderstood or evaded. It is hardly necessary to say that the consequences of a mistake in train orders, in instructions regarding breaking track for repairs or renewals, or for making temporary constructions to span washouts, may result in expensive and fatal accidents. And even minor errors, oft repeated, may prove very costly.

But the preparation of reports, specifications, and contracts is the most particular and momentous task the technical man has to perform. It is not enough to be careful in a general way. Every word, every phrase, every sentence, has a direct and vital bearing on the work governed by the documents. I have known the presence in the contract of a single word of equivocal meaning to cost one of the parties many thousands of dollars, though

when the contract was drawn there was no question regarding the intent of the parties to it.

Notwithstanding the vital importance of clear, concise, and full expression in such documents, it is not uncommon to find specifications and contracts so bad in their construction that they fail utterly in their purpose * * * as a large number of engineers and architects compose their specifications by copying and combining sentences and paragraphs from various sources, instead of by writing them, from fundamental knowledge of the construction desired. In such instances the client is protected infinitely more by the honesty, knowledge and skill of the contractor than by those of the architect.

Very few railway specifications for complicated structures are so well written that a contractor cannot comply with them to the letter, yet give the company construction far inferior to what the writer of the specifications intended, thereby gaining for himself material advantage.

The lawyers and the courts are kept busy rectifying the blunders of other professional men who do ill what they are paid to do well. I know of one contractor who has grown gray in the business of constructing buildings, who has never completed a contract without a law suit, and who has never lost a law suit. This speaks ill for the work of the architects under whom he worked, yet they are probably no worse than their fellows. If it were not good policy to be reasonably honest, many another contractor might easily approach his record.

Literary expression should, therefore, be considered as one of the most practical problems with which the engineer has to deal. It can be cultivated to a high degree of perfection by a judicious application of the principles governing the elements of correct English composition, as given in any good text-book of rhetoric and exemplified in the standard literature of the language.

WHAT CORRECT LITERARY EXPRESSION INVOLVES.

Correct literary expression involves the study of many elements: selection and arrangement of ideas in accordance with the principles of unity, coherence, and emphasis; grammar, spelling, penmanship, and punctuation; words, sentences, paragraphs, and chapters; clearness, simplicity, variety, and interest. Much depends on the means of expression, whether written or spoken; whether it is a letter, a detailed descriptive article, a theoretical article, a summary, or a book; a speech, a lecture, a debate, or ordinary conversation. The class of readers or hearers to whom the composition is addressed must be considered, also its purpose, and whether it will be read from written manuscript or from typewriting or from print, and even the style of writing, typewriting, or printing, needs careful consideration. It is manifestly impossible to give

a thorough treatment of these many and various elements in the limited space of this small book; most of them are matters of rhetoric and are taught in the schools and the college class-rooms. The present purpose is rather to point out the necessity of their individual understanding by the student and the engineer, and their application to the literary work that every technical man must do.

Listen to a first-class orator making an after-dinner speech which draws forth round after round of enthusiastic applause, and note his graceful opening, how he commands your attention, his easy style, his timely and forceful gestures, his clear emphasis, and his climax, when he takes his seat amid the ringing cheers of the company. It appears simple, but when you try to do it, you do something or leave something undone that reacts upon the entire speech, and you fail to arouse the enthusiasm of your audience, although your subject matter may be as interesting and as valuable as that of the previous speaker. You may have the ideas but lack the ability to tell others just what you mean; you may have force in gesture, but lack the ability to emphasize properly—by a pause, a comparison, or an appropriate story.

The reason why many people fail in writing and speaking is not so much from the lack of ideas, of the use of bad English, as it is

that they try to do the whole thing at once without having mastered each single element. A gesture, like the movement of a baseball pitcher, or any other motion, consists of several parts, and each part must be mastered before the whole movement can be made perfectly; a good billiard stroke appears simple and graceful only because the expert has mastered the elements of that stroke—the holding of the cue, the necessary force, the angles of the table, the “English”; an instructor in machine design does not ask his students to design a steam engine until they have mastered the various parts of which the engine is made up. The easy and forceful speaker has, by study and practice, acquired an art that conceals an art; he has acquired the art of reasoning while on his feet; he has considered the aims of his speech in connection with the character and mood of his hearers; he has carefully collated and arranged his ideas; he has mastered the elements of style, gesture, and emphasis and applied them to this particular speech; he has studied his beginning and ending and his pauses; and during his apparently informal talk he is exerting his powers of attention, concentration, and observation. The Romans had a motto, “*Divide et impera*,” “Isolate and conquer,” which, applied to the present case, may be rendered, “Isolate what you have to master and master it part by part,” to which

must be added the necessity of retaining possession of what has already been mastered before advancing to new things—that is the basis of all thorough learning. In “Literary Engineering” this principle applies equally to reading, writing, and speaking, and the engineer who knows how to read, write, and speak well has a possession not only of mere intellectual and social advantage, but also of dollars and cents value, in whatever branch of the profession his work lies.

II

RHETORIC AND GRAMMAR

Rhetoric is the art of composition, written or spoken; it aims at expounding the principles that should govern all prose compositions or speech that is designed to influence the judgment or feelings of a reader or hearer, and therefore treats of everything that relates to grace or force of style—accuracy of expression, structure of periods, and figures of speech. **Grammar** is the science which treats of the principles of language and teaches the correct use of words for the expression of thought; it teaches us to speak, read, and write with correctness, according to the established usage, as deduced from language already in existence.

Rhetoric has been given many and various definitions by writers, both ancient and modern—Aristotle called it “The art of persuasion”; Whatley, “The art of conviction”; Campbell, “The art of discourse”—but all these writers agree on recognizing it as an art rather than as a science. An art implies underlying principles based on a science, and there has been, therefore, much question as to the science or

sciences upon which rhetoric is founded. Some claim the basis as logic, others as esthetics, and others as ethics, but if rhetoric is founded upon any single science, it is undoubtedly logic, through the medium of grammar.

Grammar investigates the relations between words and ideas, examines structure of speech in general, and treats of the essentials of the language. It receives the materials of thought formed into general notions, or concepts, judgments, and reasonings; expresses them with due regard to purity, propriety, concord, and precision, and turns them over to rhetoric to be woven into discourse with clearness, energy, elegance, and special adaptation to the ends that the writer or speaker has in view. Grammar deals with the words and the sentence only; rhetoric, with the words, sentence, paragraph—the entire composition or discourse. Grammar teaches rules, and regards correct expression as an end in itself; rhetoric teaches principles, and regards expression as merely a means to an end. Grammar makes a distinction between the right and the wrong; rhetoric between the good and the better.

In both writing and speaking, single words would suffice to express detached, individual ideas—a book could be indicated by the single word “book”—but thought is made up of related ideas, necessitating the combination of words into sentences, sentences into para-

graphs, paragraphs into compositions. The selection of words and their arrangement into correct sentences and paragraphs, according to certain rules, is the province of grammar, but however correct the words and their arrangement may be, they may still fail to express the thought and to attain the special end in view. The words must be united into sentences and the sentences into paragraphs and compositions, effectively—this is the province of rhetoric. “Effective expression” and the meaning commonly attributed to the word “rhetoric” are not, however, necessarily synonymous. A statement such as “Even his rhetoric failed to convince his hearers,” is not uncommon, and implies a wrong meaning. It implies that the speaker was bombastic or tricky, and possessed the power of manipulating his words to deceive his hearers, which is the very reverse of the true teachings of rhetoric—to express the meaning clearly and exactly.

Classification of Rhetoric. As just mentioned, rhetoric is an art, based on a science, but instead of regarding it as founded on any single science, most writers prefer to recognize three departments of rhetoric, corresponding to the three sciences mentioned above, and also to the three divisions which are ordinarily made of the human faculties, the intellect, the sensibilities, and the will. These departments are:

1. Inventive Rhetoric, founded on Logic, which treats of discourse, and helps us attain exact knowledge.
2. Esthetic Rhetoric, founded on Esthetics, which treats of the "form" of discourse, and helps us attain pleasure from conversation, reading, and writing.
3. Ethical Rhetoric, founded on Ethics, which treats of the "purposes" of discourse, and helps us attain the ends desired.

The application of these principles and this classification of rhetoric to the purposes of the present work may be outlined as follows:

1. Inventive Rhetoric:
 - a. Choice of subject.
 - b. Accumulation and selection of material.
 - c. Arrangement and disposition of material.
2. Esthetic Rhetoric:

Has reference to style, and the art of expressing clearly, energetically, and gracefully, the products of Inventive Rhetoric in adaptation to the ends of Ethical Rhetoric. The elements of Style: Naturalness, Adaptation, Clearness, Energy, etc., are discussed in any treatise on rhetoric.
3. Ethical Rhetoric:

Has reference to purpose of discourse—

 - a. Instruction—to develop in the mind a new knowledge.
 - b. Conviction—to lead the mind to adopt a certain opinion.

- c. Excitation—to move the feelings and arouse interest.
- d. Persuasion—to determine the will to action.

It will require but slight consideration on the part of the reader to realize the practical application of this analysis to the work of an engineer or a salesman, and thereby to convince him of the necessity of an understanding of the principles of rhetoric and their value in his work. The salesman goes to a manufacturer, for instance, with the aim of interesting him in a certain machine, to the ultimate end of making a sale. He has accumulated, selected, and arranged his facts for discussion and argument; he presents these facts as clearly and as energetically as possible, and in the best style at his command; the order of his discourse is (a) instruction—to explain his device, (b) conviction—to make his prospective customer agree to certain general conclusions, (c) excitation—to arouse an interest in his device and a desire for it to the end of (d) inducing him to place the desired order—persuasion.

Similarly, the man in almost any position in the engineering world can apply this analysis of rhetoric to his own special case, and will see from such an application, the dollars-and-cents value of a knowledge of rhetoric and the necessity for its careful study.

Again, rhetoric may be classed as (1) Constructive, and (2) Critical. Critical Rhetoric embraces the study of rhetorical principles and of literary models and finds its most common example in the modern book review. Constructive Rhetoric consists in the practical application of these principles and the imitation of literary models. The principles of rhetoric are not the arbitrary enactments of any man or body of men, but simple deductions from the experience and observations of generations of writers and speakers, and anyone who desires to write or speak well, either in the routine of work, or otherwise, should study and endeavor to apply these principles.

There are three forms of discourse ordinarily recognized by rhetoric:

1. Ordinary representative discourse, in which the matter is presented for its own sake, without special purpose, or regard to form, and in which clearness, accuracy, and completeness are the prime essentials. Such discourse usually consists of:
 - a. Descriptions of things and events,
 - b. Narration of facts and fiction.
 - c. Exposition of truths and things (abstract).
2. Poetry, in which the matter and the purpose are subordinate to the form.
3. Oratory, which proposes an end to be attained, to which the matter and form of discourse are merely auxiliary.

The ancient writers classified Oratory as (a) Demonstrative, (b) Judicial, and (c) Deliberative, and some of the British writers class it as:

- a. The eloquence of popular assemblies.
- b. The eloquence of the bar.
- c. The eloquence of the pulpit,

but it is generally recognized that if a classification is attempted at all, it should be on a basis of purpose rather than of the occasion of its exercise. An orator, or a speaker before a public gathering or a committee, or a salesman, generally seeks to bring something to pass; he does not appeal to the intellect or the feelings alone, but also to the will. He must sway the whole man, or he will fail in the object he has in view. It is especially necessary for him to study adaptation, and his discourse, while not deficient in clearness and not offensive to the tastes of his hearers, must excel in energy and emphasis. It will be seen, then, that for a man who uses speech and writing in his work, either as a salesman or in dealing with bodies of men, the chief elements to be mastered are: the discovery of proper ideas (see page 63), their selection and arrangement (see page 82), and the style in which they are expressed, which is the field of rhetoric, to which should also be added, the cultivation of a good memory (see page 94).

Style, as stated, consists of various elements, but can always be promoted by the use of

Figurative Language, or language which deviates from the plain and ordinary method of describing an object or of stating a fact. This tends to promote clearness by associating the objects or facts under discussion with more familiar objects or events; energy, by associating the objects or facts with more exciting objects or facts; elegance, by associating the objects or facts with more pleasing objects or facts. "Figurative Language" may be divided into:

Figures of Speech, which consist of a mere modification in the form of expression, and

Figures of Thought, which involve an essential modification of the conception,

and these figures depend upon:

The Principle of Similarity,

The Principle of Dissimilarity,

The Principle of Association.

Among the more familiar Figures of Speech used for emphasis, are:

1. Alliteration—the repetition of similar sounds at the beginning of successive words:

"Apt alliteration's artful aid."

2. Paronomasia—the use of words in the same connection which are similar in sound but dissimilar in meaning:

"Not on thy *sole*, but on thy *soul*,
harsh Jew."—Shakespeare.

3. Meiosis (or Litotes)—the representation of an object as less than it really is:

“The engineer is a member of no mean profession.”

4. Pleonasm—the use of more words to express one’s meaning than are strictly necessary—an over-fullness of words in a composition—which should be sharply discriminated from Tautology, or the meaningless reiteration of a thought.

5. Hyperbole—the representation of an object as larger than it really is, or statement of a fact more strongly than is consistent with its literal truth:

“He ran like the wind.” “An elephant on his hands.”

6. Climax—the gradual rising, by more and more emphatic statements, to the fullest and most expressive utterance of our thought:

“I came, I saw, I conquered.”—Caesar.

Under this head also, there are several figures which are seldom referred to and which it would not serve any good purpose to discriminate between or to define in a book of this nature.

Under “Figures of Thought” are, first, those founded on the principle of Similarity:

1. Simile, which is an expressed comparison usually introduced by “like” or “as.”

“Books, like proverbs, receive their chief value from the stamp and esteem of ages through which they have passed.”—Temple.

2. Metaphor, which is an implied comparison, “Books, the children of the brain.”

Similes are more conducive to clearness, metaphors to energy. Either may be made conducive to elegance. The metaphor may be tested by reducing it to an equation, thus, "The ship plows through the sea"—the ship is to the sea as the plow is to the land. Any metaphor which will not submit to this test is radically defective, introducing more than four terms or suggesting an unreal similarity. The mixing of metaphors is one of the commonest faults of the bombastic speaker. Any metaphor can be converted into a simile, as for instance, the above example may be changed to read: "Books are like children."

3. The Allegory, which is an extended metaphor, and of which Bunyan's "Pilgrim's Progress" is probably the best example.

4. The Fable, which is essentially similar to the allegory, but briefer, and characterized by the free endowment of animals, and even of inanimate objects, with the attributes of reason and speech. Of this, the Fables of Aesop form a good example.

5. The Parable, which is a religious allegory.

6. Personification, which regards things inanimate as if they had life:

"The pyramids, doting with age, have forgotten the names of their founders."

The danger in the use of personification is that mere sex, and not qualities of life, be given to the object.

Under this head, also, are other figures, which it is not in the province of this book to discuss or define.

Under "Figures of Thought" that are founded on Dissimilarity, are: Contrast, Antithesis, and Irony. Founded on the principle of Association is Metonymy, the transference of names, such as:

The cause for the effect.
The container for the thing contained
The sign for the thing signified
The instrument for the agent
The author for his works

Under the combined heads of Similarity and Dissimilarity is:

Synecdoche, which includes objects that are similar in kind, but dissimilar in extent or degree. By Synecdoche, we put a part for the whole, as "sail" for "ship," or a "blade" for a "sword." More specifically it consists of the substitution of:

The concrete for the abstract
The species for the genus
The individual for the species
The material for the thing made

Its use is highly conducive to energy. It falls within the province of rhetoric to discriminate accurately between these figures of speech and to give principles which shall facilitate their effective use.

In regard to the use of grammar in ordinary technical statements, the following are a few of

a number of examples cited by Prof. T. J. Johnston in a paper before the Society for the Promotion of Engineering Education, as having actually come under his observation within a very short period:

"Generator dissembled."

"More customers, cheaper the cost of production."

"Formerly the slag of steel works was considered purely a dead waste, but some few years ago its valuable fertilizing value was discovered, and now this formerly valueless waste is one of the world's most valuable fertilizers."

"A body like you propose."

"This operation is to be operated at every station."

"In a shaft eight thousand feet deep, the cost of cooling the temperature would be considerable."

"There is no reversing plugs."

"For which the unenviable distinction of being the worst in the world is often claimed for it."

"To this was added two . . . generators."

"Gas-engine would develop along the same lines the steam-engine had done."

"The correctness of my conclusions have been amply demonstrated."

"An almost infinitesimal amount."

"The rings . . . are circular in shape."

"The car is well lit."

"The cost of superimposing a floor on the present system would cost as much as the original cost of building the present system."

"The company find it impossible to buy only at retail prices."

"Which renders great economy and rapid construction."

"A fewer number will perform a given amount of work four times as long as any other cell of equal size."

III

ORTHOGRAPHY AND PUNCTUATION

Orthography is that branch of grammar which treats of the elementary sounds of a language, how to represent them by letters or symbols, and the combinations of these letters or symbols to represent words; it includes also the right dividing of words into syllables (as when a word has to be divided at the end of a line), and is directly related to punctuation. In its more restricted and more general understanding, orthography is synonymous with the art of correct spelling. This is probably the most unsatisfactory branch of our grammar. The orthography of the English language is a combination of the phonetic and etymological principles, resulting from the transference of words in whole or in part, from other languages, and the gradual changes and combinations that such words have undergone at the caprice of generations of writers. Hence, in the English language, as now spoken and written, there is in general so imperfect a correspondence between the sound of a word and the sounds of the several letters written

to represent it, that the spelling of almost each individual word has to be learned by itself.

This fact has given rise, during the past few years, to a movement in favor of the simplification of spelling; some enthusiasts desiring to drop all silent, and, as they say, redundant letters, while others more conservatively call only for a simplification and standardization of certain classes of words. The National Educational Association has adopted simplified forms for the following twelve words only:

altho	pedagog	thoro
catalog	program	thorofare
decalog	prolog	thru
demagog	tho	thruout

As the tendency in the direction of simplified spelling is growing among periodical publishers, a writer for the press would do well to ascertain, whenever possible, the feelings in this respect, held by the editors and publishers to whom he may desire to submit manuscripts. The majority of publishers have established sets of rules governing typography, orthography, etc., for the use of their writers, and in some cases these rules, in printed form, may be had by contributors to these publications.*

The leading advocate of simplified spelling among the American authorities is probably

* Such a set of rules is given on page 289.

the "Standard Dictionary,"* in which the editor says:

"In its effort to help in simplifying the spelling of words, this dictionary is conservative, and yet aggressively positive along the lines of reform agreed upon almost unanimously by the leading philologists."

The policy thus briefly outlined has made the "Standard Dictionary" the standard in many offices and it may always be followed as a safe and reliable guide in all matters pertaining to correct spelling.

The "leading philologists" referred to are no doubt the members of such associations as the American Philological Association, the Spelling Reform Association, and the Philological Society of England. These are the foremost bodies interested in the development of simplified spelling, and their recommendations, while not as yet generally adopted by publishers, tend toward a simpler, more logical, and more uniform style of orthography, resulting in a great saving of time in writing. The following general rules have been recommended for the use of those who are in sympathy with this movement:

Rule 1. (1) Change final "ed" to "t" when so pronounced, as in abashed (abasht), wished (wisht), etc., and, if a double consonant precedes, drop one of the consonants, as in chipped (chipt), dressed (drest), hopped (hopt), etc.

*Published by Funk and Wagnalls, New York.

(2) Retain final "ed" when the "e" affects a preceding sound:

(a) When the preceding vowel sound is long and expressed by a single letter, as the following:

Baked, not **bakt**, as bakt would be pronounced as **backed**.

caked, not cakt

craped, not crapt

draped, not drapt

gaped, not gapt

chafed, not chaft

coped, not copt

moped, not mopt

roped, not ropt

N. B. The "e" does not affect the preceding vowel sound when expressed by two or more letters, as in booked (bookt), bleached (bleacht), crouched (croucht).

(b) When a preceding "c" has the sound of "s," as in chanced (not chanct), forced (not forct), faced (not fact), etc.

Rule 2. (1) Drop "ue" at the end of words when the preceding vowel is short or a diphthong, as in dialogue, catalogue, etc. Thus, spell dialog, catalog, etc.

(2) Retain "ue" when the preceding single vowel is long, as in prorogue, vogue, plague, vague, fatigue, etc.

Rule 3. (1) Drop final "e" from words ending in "ite" when the "i" is short, as hypocrit, opposit, requisit, etc.

(2) Retain final "e" when the "i" is long, as in finite, polite, unite, etc.

Rule 4. Drop final "te" in words like cigarette, coquette, quartette, etc. Thus, spell ciga-

ret, coquet, quartet, and all words of the same class which are Anglicized.

Rule 5. (1) Drop final "me" in words like programme, and spell program.

(2) Retain final "me" in written medical prescriptions, where the form **gram** might be mistaken for **grain**, and cause serious error.

Rule 6. (1) Drop final "e" from words ending in "ile" when the "i" is short, as in fragil(e, ductil(e, etc.

(2) Retain final "e" when the "i" is long, as in gentile, exile, etc.

Rule 7. (1) Drop final "e" from words ending in "ine" when the "i" is short, as in disciplin(e, doctrin(e, feminin(e, etc.

(2) Retain final "e" when the "i" is long, as in sunshine, machine, etc.

Rule 8. (1) Drop final "e" from words ending in "ise" when the "i" is short, as in premis(e, treatis(e, etc.

(2) Retain final "e" when the "i" is long, as in wise, etc.

Rule 9. Drop "a" from "ea" having the short sound of "e," as in feather, leather, etc.

Rule 10. (1) Drop final "e" from words ending in "ve" when the preceding vowel has its common short sound, as in repulsiv(e, talkativ(e, etc., or is expressed by two letters, as in griev(e, groov(e, etc., the "r" counting with the vowels.

(2) Retain final "e" when the preceding vowel is single or long, as in five, drive, etc.

Rule 11. Change the digraph "ph" to "f" wherever it has the sound of "f," as in diphtheria (diftheria), telegraph (telegraf), photograph (photograf), naphtha (naftha), etc.

There have also been rules for the uniform spelling of chemical terms formulated and adopted by the Section of Chemistry of the American Association for the Advancement of Science; and of geographic names, by the permanent Board on Geographic Names*. The forms recommended by both of these bodies have been adopted by the editor of the Standard Dictionary.

Punctuation, which is sometimes considered as coming under the head of Orthography, is, in its broadest sense, the art of dividing literary compositions by points or stops to show more clearly the sense, and the relation of the words. If a sentence consisted of a simple statement only, with just sufficient words to express a single idea, the only mark of punctuation needed would be a period at the end. But when the statement is compounded and complicated by modifiers and conditions, there arises the necessity for some sort of device that will clearly indicate the divisions and the relationship of the different parts. Such a need is supplied by the various marks of punctuation. Their proper use is partly a matter of custom and partly just common sense. Custom should be observed, if only to prevent the appearance of eccentricity on the part of the writer. It is not in the province of this book to give detailed

* The report of this board, containing a complete list of these spellings, can be obtained at a small cost from the Public Printer, Washington, D. C.

rules for the use of the various marks of punctuation—the comma, semicolon, colon, period, etc. These details can be found in any work of grammar and in many other books, and it should only be necessary here to say that great care should be exercised in their use. Their proper use enables the writer to make his meaning clear; their omission or misuse—even of a comma—may render a sentence obscure and ambiguous. For instance, in the discussion of a certain accident:

“The engineer said the contractor was a man not to be depended upon.”

Here the contractor is certainly the guilty party, but by the insertion of two commas, the tables are turned against the engineer:

“The engineer, said the contractor, was a man not to be depended upon.”

The engineer who is called upon to write reports, contracts, and specifications may, as has often been the case, by a misplaced mark, involve himself in a lawsuit. In literary work, such as books and periodical articles, if errors are made in a contribution otherwise acceptable, the editor will correct them, according to his prescribed policy, but this revision should properly be done by the writer. A badly punctuated, badly spelled, and badly written composition always stands less chance of acceptance than one containing even less valuable matter, but carefully prepared for an editor's examination.

IV

WORDS AND PHRASES

Words—single parts of speech, or combinations of sounds, expressing ideas—and **Phrases**—two or more words forming particular modes of speech, or Idioms, and as a unit, expressing a single idea—are among the most potent instruments at the command of man, and of the writer in particular. By their proper use the engineer makes clear his meaning to clients and contractors, convincing one of the wisdom of his propositions and binding the other to execute them. Through the improper or careless use of words, the engineer lessens his chances of making himself understood by clients and contractors, and provides loopholes for the latter to evade their obligations, and may even bring ultimate confusion upon himself. If these statements are true of words and phrases in general, how much more true are they when applied to specialized technical terms!

There is unquestionably much carelessness displayed by engineers and engineering writers in their use of terms to designate specific engineering ideas. So many lawsuits have centered around the meaning of some technical, or even non-technical word, that they now

excite no particular interest, and we are likely to skim over the abstracts of such cases with little thought that our own use of words is seldom commendable for its perfect absence of ambiguity. We speak of "dirt roads" when we mean "earth roads," and see no danger signal in our perversion of the word "dirt"; we also speak of the "inauguration of a plant" when we mean the "installation of a plant." In a word, we unconsciously use metaphorical, inaccurate, and involved expressions so frequently that we are ever in danger of being vague when we wish to be precise. In most cases, it is true, the context is such as to prevent any misunderstanding as to the idea intended; but this is only scant justification for the careless use of words, for the reader must then gather from several words or sentences the idea which should have been conveyed by a single term.

The Basis of Engineering Terminology. A misspelled or wrongly interpreted word may result in serious consequences, even in a death, and partly for this reason, and partly on account of the unchanging nature of matters pertaining to medicine and surgery, medical terms have been standardized. These usually apply to certain scientific facts, and have been given Latin names which convey the same understanding to medical men in all parts of the country, regardless of localisms. But in

order to use and understand engineering terms correctly, the establishment of a precise code of such terms, to be followed in all engineering writings, is not necessary. In fact, the method of the development of engineering terminology and its status at any one time does not permit of this. The objects and phenomena with which engineers deal are in most cases not specialized scientific facts, to be given Latin names and discussed in abstruse language; rather they are things with which men in general are more or less familiar, and to which, in many cases, they have already given names. When the engineer comes to deal with them, he generally takes over the word that is already in the language, but he may later extend its meaning to cover analogous ideas, or he may restrict it to a specialized phase of the original idea, to suit his needs. When the word in its final meaning thus developed comes into general acceptance among engineers, it forms part of recognized engineering terminology. There are always many terms still in progress of formation or development; different writers use them differently, and they usually also have an established meaning in our general vocabulary, but it is desirable that the technical use of the word should follow as closely as possible its more general use; the modification of its meaning for technical purposes must be arrived at gradually.

It is important to note also that a definite technical term may have varying meanings when applied to different cases. Thus, the "foundation" for a column is generally a mass of stone, concrete, etc., upon which the column rests by means of a base or shoe; but the masonry "foundation" may, in its turn, be supported upon an artificial "foundation," or on piling, or on a caisson. The ultimate "foundation" upon which the caisson rests is the hardpan or rock upon which it is designed to rest its load. The word "foundation" is a generic, rather than a particular term, and functionally, it will correctly apply to each of the above cases.

New words are often coined to meet the difficulties of technical phraseology, just as man's material needs are met by new contrivances, but it is not always advisable to coin particular words for each of the separate ideas to which any one word may be applied.* At least the necessity for a specific name in any one case must become clearly apparent before seeking for that name. The deliberate creating of specific engineering terms is, as will be evident, not an easy matter, and in most cases it would prove not only thankless but also valueless.

* Julius Caesar, who was an authority on words as well as on war, says in his work on "Analogy," "Avoid every unusual word as a rock." This may be open to a too general or ambiguous interpretation, but serves as a warning against the too promiscuous coinage of unusual words.

What each writer of engineering can do, however, is to specify his meaning clearly in every case, instead of carelessly using such a word as "foundation" with its different meanings in successive sentences.

The Choice of Technical Words. In the choice of words the chief object of the engineer should be to make himself clearly understood, not in New York or San Francisco alone, but by the capitalist, manufacturer, contractor, or their engineering representatives, in any city of the land, and possibly in other countries as well. If, then, the engineer can find a word ready at his hand which is in common use and of unmistakable meaning, he will generally do better to adopt it than to try to introduce some other word which may be more correct from the etymological viewpoint. But where a word is in use, even if quite generally, which has been badly perverted from its original and proper meaning, and which, in the absence of qualifying or explanatory notes, might actually mislead, then an attempt might well be made to put down such a use for that word and to substitute one whose meaning is unmistakable.

An excellent example of the serious consequences that may follow the careless use of words is given in Wait's "Engineering and Architectural Jurisprudence (page 526), where the indiscriminate use of the words "road"

and "track" in a set of specifications led to a lawsuit under a contract to build a road between certain termini at a specific price per mile. This gave rise to a dispute as to whether the mile of track or the mile of roadbed was meant to be specified, and offers an instance of confusion arising from the indiscriminating use of two common words. In fact, it is these common words that give the most trouble. What is a "road"? Until we come to define it we are sure that we know exactly what a road is. Richard Grant White in his book on "Words and Their Uses," takes up the meaning of the words "railway" and "railroad," and argues that a "road" is a term properly applied to a roadbed, or to all that area set aside for road uses. In that sense, all the "right of way" would be the "road," whether of a wagon road or a railroad. The word "way," on the other hand, is a narrower term, and applies to the ways or guides that support the moving body. The "ways" that a ship slides down, a "tramway," a "railway"—these are rightly termed "ways" and not "roads." It may not be difficult to find objections to this argument in the use of the term "railway," but at present we are not so much concerned with the question of preference as with the habit of using words with the same precision that we use symbols in an equation.

An example of the extent to which the mis-

use of technical terms becomes rooted and grounded in engineering literature, was offered in the repeated substitution for "watershed," of "drainage area" or "catchment area" in a report of the Commission for Additional Water Supply for New York City, prepared a few years ago by several prominent engineers. In commenting on this at the time, "Engineering News" said that of the technical words in common use by engineers, few have been extended further from their original meaning, and at the same time kept in close relation to it, than "watershed." This word is often used to denote a catchment or drainage area, while its real meaning, as given in the "Century Dictionary," is as follows:

Watershed: The edge of a river basin; the line separating the waters flowing into two different rivers or river basins * * * sometimes called the **water parting**, and in the United States, more frequently and popularly, the **divide**.

The "Century" also quotes the following discussion of the term from J. D. Whitney's "Names and Places":

The summit of the pass is called the **divide** or **watershed**. In this last word the "shed" has not the present meaning, but an obsolescent one of "part" or "divide." Skeat says: "The old sense of 'to part' is nearly obsolete, except in 'watershed,' the ridge which parts river systems." * * * The "watershed" of any river basin limits its "area

of catchment," as the hydraulic engineers call it.

Now and then an engineer writes "catchment area," or "drainage area," instead of "watershed." The dictionary already quoted inserts under the main title "area," the following:

Area of Catchment: Among hydraulic engineers, the area, the rainfall or drainage of which is to be made available for furnishing water at a desired point. Catchment-basin: Same as Drainage-basin.

And again, one of the meanings of "Basin" is given as follows:

Basin: In geography, (a) the area drained by a river. The term is ordinarily used only when speaking of a large river, and then includes the entire area drained by the main stream and its tributaries. The line separating two river systems from each other is the watershed.

Thus these various quotations clearly point out that a "watershed" is a line and not an area. As between "catchment area" and "drainage area," doubtless the latter term is more commonly used in America; but in considering available sources for public water supply in such a way as to include both rainfall and area, "catchment" is particularly expressive of the exact thing in mind. "Drainage area" is likewise notably appropriate when one is considering the extent of territory drained by a stream or by a sewerage system.

A well-known engineer some time ago raised an objection to the use of the term "Census of Street Traffic," urging that "Travel" should be substituted for "Traffic"; that "Traffic" means goods and merchandise; and should not be applied to the number of horses and vehicles used for their transportation. While this may appear quite reasonable, reference to two reliable American dictionaries shows that the word "Traffic" is correctly used.

From the "Century Dictionary":

Traffic.—1. An interchange of goods, etc.

2. The coming or going of persons or the transportation of goods along a line of travel, as on a road, railway, canal, or steamship route. (Example) "Traffic during that 36 hours was entirely suspended."

3. The persons or goods collectively passed or carried along a route or routes.

Travel.—6. The passage or concourse of travelers; persons traveling; as, "The travel was very heavy on outgoing trains and boats. (Colloq.)

From the "Standard Dictionary":

Traffic.—The exchange of goods, etc.

2. The business of transportation, as of persons, animals, or goods; as railroad or canal traffic.

3. The subjects of transportation, collectively; the persons, animals, or goods carried.

Travel.—4. (Colloq.) The movement or concourse of travelers; as, the June travel to Europe

The foregoing quotations show that "Street Traffic" may correctly be used to indicate either persons or goods passing along a street, and hence, by inference, to denote passing horses and vehicles. Both authorities class the use of "Travel," when applied to those traveling, as colloquial. The engineer referred to, however, maintained that, in spite of the dictionary definitions, there is no sufficient reason for not adopting a more exact and satisfactory word to describe, in a technical sense, the action referred to, as the meaning of technical terms and the nomenclature of engineering, accepted by the profession, is not always in accord with the definitions in the dictionaries, whose function it is to define rather than to dictate. It is a well recognized fact that the engineering profession has been more careless than any other in the adoption and use of accurate technical terms, but as already stated, the method of the development of engineering terms does not permit of a clearly defined, accurate, and scientific system of nomenclature.

This lack of precision is also well exemplified in the terms used in the drafting room. The designs for a building are collectively called "plans," but in another sense, only the horizontal projections are "plans." Some draftsmen make "front views" and others make "front elevations"; some prepare

"plats" while others get up "plots"—though innocent of any attempt at intrigue.

A type of expression that has sometimes been questioned, is the use of the singular or plural in such terms as a "ten hour's journey" or a "50-foot span." These are idioms of the language, based on euphony, that have been used by the best writers probably for centuries, and they must be recognized as such. Any person who says a "50-feet span" violates the idiom of the language for the sake of a rather far-fetched purism, and if he should submit a manuscript to a periodical, containing this expression, the editor would, before printing it, change "feet" to "foot," just as he would correct an obvious error in grammar or spelling. Further, in this usage, "foot" must be considered as an adjective, and as such has no plural form.

One of the most familiar cases of confusion of nomenclature is one that has arisen during the past few years with the development of the use of the combination of concrete and steel, generally known as "reinforced concrete," or "concrete-steel." In translations of articles from foreign publications, however, the English language has been seriously strained, and we have "armed cement," "armed concrete," "ferro-concrete," and various other misapplications, reaching the climax in the comments in one of the technical journals on the need of

“more vigorous safeguarding of the quality of the cement and the entrained steel.”

It is recognized that phraseology is but a matter of custom, subject to change at the hands of various authorities, but a question arose some years ago regarding the right of a former publication committee of the American Society of Civil Engineers to rule out the use of the word “lineal” and substitute “linear” in such expressions as lineal inch, foot, etc. In the slight controversy that followed, one writer stated his opinion that in connection with units of measurement, “lineal” should be retained as being an older and better form. Another writer made the distinction of using the two terms of applying the word “linear” to determine dimensions in straight lines, for instance, a horizontal plane, as from center to center of bridge towers; whereas “lineal” is one of more inclusive scope as referring to the dimensions taken along the cables of the roadway, or the sinuous contour of a pipe line. This view of the case appears to be justified by the “Century Dictionary,” also by comparison with such relative terms as “radius,” implying a fixed dimension, versus “radial”—a general reference to a line or lines projected from a center towards a circumference; and in the same sense, the terms “diameter” and “diametral”; the latter being well established.

in designating the gear system, "diametral pitch."

Another usage that has been discussed concerns the use of the word "lacing" to replace "double latticing," which has been considered by some engineers as unwarranted. "Lacing" is defined as "a fastening with a string or cord through eyelet holes"—"a cord used in drawing tight or fastening." A "lattice" is "any sort of wood or iron, made by crossing laths, bars, or rods, and forming a network." As bridge parts are "latticed" together to obtain greater rigidity, it seems wrong to call it "lacing," and that "single and double latticing" covers all the needs.

Many other examples are available to show the differences of opinion regarding the meanings of certain technical terms, and the investigation and study, whenever possible, of such analyses would tend toward a more correct employment of terms not thoroughly understood. The use of a technical term in a book written by a recognized authority becomes the basis of correct usage, and subsequent writers will follow, like a flock of sheep, the diction of this master mind. It has been demonstrated by many examples that this staying power of the language and usage resists the attacks of time and that the corruption of a word will outlive its originator and perhaps many succeeding generations.

The Use of Common Words. What has been said above as to the choice of words refers especially to technical terms, but the engineer writing for the press or writing reports and specifications must also give careful attention to the use of the more common words and phrases. What can better express the necessity of this than the following advice, given to contributors to "Engineering News"?

Make It Short.

"Aspirants for journalistic honors should religiously eschew polysyllabic orthography. The philosophical and philological substructure of this principle is ineluctable. Excessively attenuated verbal symbols inevitably induce unnecessary complexity and consequently exaggerate the obfuscation of the mentality of the peruser. Conversely, expressions which are reduced to the furthestmost minimum of simplification and compactness, besides contributing realistic verisimilitude, constitute a much less onerous handicap to the reader's perspicacity.

"Observe, for instance, the unmistakable and inescapable expressiveness of onomatopoeic, interjectional, monosyllabic utterances, especially when motivated under strenuous emotional circumstances. How much more appealing is their euphonious pulchritude than the preposterous and pretentious pomposity of elongated verbiage."

"Fine writing" is a fault—it is used in newspapers, sometimes for the sake of elabo-

rating on details, or, in other words, to fill space, as in the following example, which appeared in a Texas newspaper:

A bright sun and a pleasant afternoon seemed to halo the happy occasion, and its refulgence to forecast the happiness of a union of two young hearts that have been devoted from youth and young girlhood through the years to the full maturity of young manhood and womanhood, and at last so auspiciously brought together under the holy sanction of God's ordinance to beat as one.

On the very threshold of their lives they start together along the journey of existence, hand in hand, heart to heart, full of that hope and that joy which aureoles the vistas that stretch out before them and gives promise of so much of that brightness that pleases and gives zest to life.

After the ceremony which made them one, a wedding dinner awaited them, and in that feast of good things they read an earnest, it is hoped, of the largess fate with kindly hand, has in store for them throughout all their years to come, and with the blessings of those they love and who love them. It is the sincere hope of all their many friends that no shadow may ever fall upon their lives and only fragrant flowers bloom along their pathway.

Often, also, in newspapers, the employment of circumlocutory or vague expressions are used to tell of a death or to hide a disagreeable or vulgar fact, as in the following example, from an English paper:

We are being constantly reminded of the certain, and it may be sudden, visit of "the angel with the amaranthine wreath," and it is our painful duty today to chronicle the melancholy fact that one who has played his part, and played it well in life, has passed through nature to eternity.

In oratorical diction, an elegant "flow of language" is used for its impressive effect on the audience. But "beating around the bush";

elegance and copiousness of diction; the use of superfluous words and details—redundancy, tautology, verbosity, etc.—have no place in technical writing. Yet superfluous matter in manuscripts is one of the greatest troubles editors have to contend with, and even in specifications, in the preparation of which conciseness is second only to clearness, superfluous clauses are by no means uncommon, as, for instance, in the following clause taken from a printed set of specifications:

It is expressly specified that in entering into the agreement to perform the work herein specified, the contractor admits that he has read each and every clause of these specifications and the circular of instructions, fully understands the meaning of the same, and that he will comply with all the requirements herein set forth.

Here 50 words have been used to say—what? Merely that the contractor who has signed the contract has read its requirements—an assumption that is implied by the act of signing the contract. The clause is wholly superfluous on that account, but leaving aside any such legal considerations, consider only the wording of the clause. There is no need of saying that anything is “expressly” specified in a specification. Everything in a specification is “specified” and nothing is any more “expressly specified” than anything else. The words “in entering into this agreement to perform the

work herein specified," add nothing to the clearness or scope of the clause, for the specification certainly relates to no work outside the work "herein specified." Again, "the contractor admits that he * * * fully understands the meaning of the same." Aside from the fact that it is hard to understand how a man can "admit" that he understands, it is unnecessary for the contractor to say so, as his signature "admits" that. Finally, "he will comply with all the requirements herein set forth." Of course he will. What are the specifications and contracts for if not to insure compliance with their requirements? And being so, there is not the slightest need of using even ten words to state the fact.

At the same time, while the use of common, plain words is advisable, discrimination must be shown in their use. The dictionaries contain more than 100,000 words and the average man knows only about 3,000. The writer with a slim vocabulary repeats words too often, frequently within a few lines. This not only makes monotonous reading, but also makes the reader feel the narrowness of the writer's vocabulary, which in turn implies narrowness of thought.

For purposes of our mere existence, a few hundred words would serve us; few ideas are necessary for mere existence, and generally speaking a man of few ideas has few words

at his command. A man who has 1,000 words for expressing his wants, feelings, and observations has fewer wants than a man who has at command 2,000 words. That most of us feel this need of words is well indicated by the frequent use of such expressions as: "You know what I mean"; "I can't think of just the word I want"; "I had that word on the end of my tongue"; "The right word will come to me in a minute," etc. Sometimes it comes but oftener it does not.

Not only must the writer have a wide range of choice, but also the reader must have a sufficient number of words at command to get the thoughts of the writers he reads. Two cases of evident lack of proper words to express the exact meaning were shown in two specifications sent to a periodical, one of which spoke of "demoralized rock" and the other of "wholesome earth." The editor suggested that contractors might have to attend courses on Ethics and Dietetics, in one to learn to know whether he is associating with reputable stone or not; and in the other to be taught to distinguish palatable from unpalatable soil.

It seems hardly necessary, then, to say that every one should try to get a large vocabulary—and constantly try to enlarge upon that. Words represent wealth of thought; the more words, the more ideas. If a writer has several words that represent the same idea he can

express exactly what he means better than if he had but one word, and he can give a variety of style in his writings that rests the reader's mind and adds to his interest and enjoyment in the work. Therefore, add to your store of words in order that you may have a richer mental life, that you may better understand and appreciate writers who do have many words, and that you may never be at a loss for the right word when you want it.

But how can a vocabulary be enlarged? In the first place, two kinds of vocabularies must be recognized; first, it is a commonplace that we understand many words that we never use—this may be called our “passive” vocabulary, and the words we actually have use for may be called our active “working” vocabulary. In the opulence of our language we should discriminate between these and strive to enlarge the latter—by the study of dictionaries, books on synonyms, glossaries, and the special vocabularies employed by separate trades and professions, always remembering that words have a suggestive power that is greater than their dictionary meaning.

We will not discuss the troublesome words “it,” “they,” “their,” and “them,” and a number of other words, the indiscriminate use of which is a source of much ambiguity in technical writing; their proper use is a matter of grammar. We would rather warn the en-

gineer-author against the employment of certain overworked pet expressions and to urge either their disuse or the acquisition of new words and phrases that will convey the meaning just as well. A few of these are:

Up-to-date (as an adjective)

Of course

In this connection

In addition to

That is to say

As will be evident

Due to its, this, that, etc.

It should be noted

Within the scope of

In other words

Owing to the fact that

On the other hand

This feature of the subject has now been considered long enough to show most of the faults in literary expression that come from the improper and careless use of words and phrases, and which are caused chiefly by scantiness of vocabulary. We will conclude by quoting from an address by George A. Wardlaw, before the engineering students of Cornell University:

“Careful reading of the classics will help materially to overcome both defects (‘inapt diction and grammatical heresy’), for the classics are classics only because they put sound thoughts in pure language. Here the elements

and qualities of style are handled with great delicacy of touch; the masters are at work painting word-pictures of rare merit; the right word is in the right place; there is harmony between verbs and noun; pronouns are not uncertain about their antecedents; and the "lid" is on the split infinitive. There is clearness and force and efficiency. Prose classics for grammatical purity, then; poetry for clear and forceful diction; both alike for rhetorical beauty and literary efficiency."

V

INSPIRATION AND MOTIVE IN LITERARY WORK

Why is the professional man more inclined to literary work than the commercial man? The conditions of attaining success are vastly different; for instance, display advertising is essential to the success of the commercial man; but as such practice is contrary to the professional etiquette of the doctor, lawyer, or engineer, the professional man, and this refers to the engineer especially, is moved to literary work, frequently, by a desire for publicity (see page 10).

“* * * self-advancement is the motive which causes the production of most of articles in our engineering publications. An engineer completes a piece of work and says to himself, ‘Now, if I write an elaborate description of this work it will add to my professional reputation.’ Really the question he ought to ask is this: ‘Is there anything in this work I have done that my brother engineers—perhaps my business rivals—would find it useful to know about?’ When he solves a difficult problem does he say: ‘I ought to publish the solution of that problem to help some other fellow who may also have to struggle with it’?

“That is the standard which I want to see

followed more and more by the engineers who create engineering literature; * * * The adoption of this standard will do more than anything else to solve our difficulties and on the other hand to make accessible a great amount of valuable and useful information that is now being selfishly hoarded by private interests.”*

The business man seeks to build up a big commercial machine—manufacturing, wholesale or retail selling, etc.—and needs comparatively little book knowledge, but must know the trend of markets and values, manufacturing processes, and business methods. The professional man, on the other hand, is an independent, one-man power, or a part of a small organization, or a unit in a large organization. He needs a great deal of theoretical instruction, as given in colleges, books, periodicals, lectures, etc.; also a great deal of practical instruction and special training, obtained from shop work, field work, etc.; while, in common with the commercial man, he must have a wide knowledge of human nature.

Inspiration to literary work may be drawn from natural ability,

surroundings,

tendencies derived from

previous training,

present occupation,

all of which are more closely identified with

*From address on “The Making of Literature for Engineers,” before the engineering students of the University of Michigan, by Charles Whiting Baker, Editor of “Engineering News.”

the work of the professional man than with that of the commercial man.

Motive in writing may be

- to gain publicity (as mentioned above),
- to make money by
 - sale of literary productions,
 - securing business through correspondence,
- to fill a gap in the literature of the profession, aside from any desires for money or fame,
- to explain a new principle or theory,
- to describe a new device,
- to correct an error or false theory,
- to relate an experience that may be of interest to the profession,
- to bring together scattered fragments of information on any special subject,
- to meet the requirements of his occupation, as in reports, specifications, etc.,
- to make public the results of original research,

Motive in speaking may be

- to gain publicity,
- to make money by lecturing,
 - teaching,
 - interviews,
- to address public bodies, council boards, courts, committees, boards of directors, etc., on behalf of special interests.
 - public gatherings—social or otherwise—for entertainment or instruction, *e. g.*, to announce new discoveries in science, to commemorate a special occasion, to eulogize some one.

VI

ESSENTIALS TO SUCCESS IN LITERATURE

The first essential to success in any work is to have a definite aim, and this is especially so in writing and speaking. The motive will shape the style of the work, so first decide on the motive and then fit everything to that. In technical literature, however, while aim is a primary essential to the writer's success, an essential, hardly less important, to the success of the articles is that they should be written by technical men. A great deal of our present-day engineering literature is produced by men who not only are not engineers, but have had no technical training at all. During the past few years the business of the "literary hack" has developed to large proportions and has extended into the realms of technical literature. These hack writers are, as a rule, men of newspaper experience, with a greater knowledge of what is interesting and popular than of what is of practical value, and with considerable ability and an untiring industry in the collecting of information regarding new things in the industrial world, and in collating and presenting this information in attractive readable

form. Their productions find a ready market in the more popular technical periodicals, but they lack the essential quality of accuracy, based on the writer's knowledge of the subject or of its fundamental principles, which can be possessed only by men who have had special training.

For success in **Technical Authorship**—writing of books, and the more substantial forms of literature—and in **Technical Journalism**, are necessary :

- Knowledge of fundamental principles,
- Years of special training,
- High scientific ability—mathematical, mechanical, analytical, constructive,
- Vital knowledge of subject,
- Skill in collecting and arranging ideas, and in presenting them in logical order and attractive form,
- Appreciation of the information that prospective readers will find of value,
- Judgment in timeliness, or adaptation to the age and interest of prospective readers,
- Powers of observation, concentration, and analysis, and organizing ability—a keen eye for news value, and faculty for discriminating between essentials and details,
- Power of expression,
- Style, clearness, judgment, industry, perseverance,
- Reputation, position, confidence, authority in reference to subject, integrity.

For success in **Speaking**, are necessary most of the essentials listed above, but especially:

Vital knowledge of the subject,
Powers of observation and concentration,
Judgment in adaptation of subject and style to hearers,
Appreciation of kind of information hearers will find of value and interest,
Reputation, position, authority,
Power of reasoning while on feet, self-control,
Attractive method of presentation,
Command of language,
Style, clearness, judgment, confidence,
Good voice, address, grace, force.

VII

WHAT TO WRITE ABOUT

It is discouraging to any writer to work for days or weeks over the preparation of a manuscript, to have it rejected by one after another publisher, until it has gone the entire round of the possible purchasers. Yet this is the fate of many manuscripts on which trouble, expense, and time have been lavished to make them most presentable. Many well-prepared manuscripts never see the light of day in published form, and others which are published never bring satisfactory financial returns because the writers failed in judgment in the basic element of their work—the selection of a suitable subject and method of treatment. Every technical periodical receives many more offerings than it could possibly find space for in its year's issues—"Engineering News," for instance, receives over 1,500 a year from outside contributors—and some of these must be rejected. The first rejections are naturally those on subjects of least practical value to the readers. The journal whose literary selections are made with the reader's interest in view; whose choice of matter is based on "its usefulness to the man in the office, in

the shop and in the field," will have to reject many of these contributions as unsuitable entirely on the basis of subject matter. It therefore becomes a matter of first importance to the writer to know what to write about that his contributions may receive consideration; and then a matter of hardly less importance to know how his manuscript should be prepared that its consideration may result favorably.

The first matter depends on the selection of a subject in which engineers are interested, the proper treatment of the subject, and the submission of the manuscript to the right journal. This involves careful thought as to the current trend of engineering literature, and the literary policy of the journals to which it is proposed to submit the article, the former of which matters will be outlined here. The second feature, that of preparation and submission of manuscript, is treated in detail on page 112.

What Kind of Information is Most Useful to the Engineer? The greatest need in engineering literature at the present day is better quality. The quantity is all-sufficient. The working engineer does not need more journals nor more engineering society proceedings, nor does he ask that they be made more bulky. He does ask—and he has a right to ask—that his precious time be economized by those who appeal for his attention. He needs the aid of

engineering literature; never was practical knowledge in greater demand; but he complains—and he has a right to complain—when the two grains of valuable information he desires to use are hidden in two bushels of chaff. He has no time to “seek all day till he finds them,” as Shakespeare put it. On the contrary, if he takes too much time to find the thing he wants, he must make shift to do without it.

It may not be generally recognized what an entire change has come over the whole field of engineering literature during the past few years, and how urgent is the need that old standards be abolished and new standards created. While the working engineer demands quality and not quantity in his technical literature, it ought first to be made clear that engineering literature is published primarily for the working engineer and not for the amateur or the theorist. The writer of a paper for an engineering journal or an engineering society ought to aim, first and foremost, to make his paper practically useful to his professional brethren, and the measure of merit of his paper is the extent to which he succeeds in this.

It should be understood that this standard excludes elementary matter, designed not for the working engineer, but for the student who is preparing himself for professional life. The high-class technical journal does not attempt to give an elementary education, or to dupli-

cate what has already been learned in the college class room. It excludes from its columns nearly all matter of an elementary nature and such material as may be found in standard text-books or which is already a matter of common knowledge to the profession. It seeks to record for the benefit of its readers such information as is not yet found in text-books, and which never will find a place there nor be taught in the class room. It is always looking for information on new and better ways of doing work; on new and better tools, devices, and processes, and wherever such progress is being achieved, it is the province of the technical press to investigate that progress and to make it public for the general benefit.

This standard assigns an inferior place to matter which is merely curious or amusing, or entertaining, or of popular, rather than technical interest. Not that such articles should be wholly excluded, as a representative journal of the engineering profession ought to have something more in its pages than mere aids to the day's work. It should help the engineer to a larger outlook on the world's affairs, but while these things may have a place, they must always rate second to the articles of practical usefulness.

Descriptive Articles. Now, what sort of papers are the most useful and what are the least useful to the working engineer? Consid-

ering the last question first, the least useful articles are those descriptive of particular engineering works. Such articles consume a large proportion of the space in some engineering journals and society transactions, and there is no doubt that they form one of the chief reasons for the growing habit of leaving these publications to accumulate unread on the shelves of libraries or to find a final end in the waste basket.

And yet the situation is not generally understood by any means. Some readers still look for descriptions of particular engineering works in their papers, and think that they are really receiving something when page after page is filled with long, detailed descriptions of this or that or the other piece of engineering work. It may seem strange to say that these descriptive articles are the least valuable material; in fact, that they should not have the first place. There was a time, and that not many years ago, when engineering journals consisted almost wholly of such material, but no journal could today attempt to publish descriptions of every work of importance—every bridge and water-works and mine or power station—nor would these descriptions answer any good purpose. It may be as is sometimes claimed that multitudinous pages of such matter make a big showing, but no one ever wades through articles of this sort, unless

they are read by engineers who are too young and too little experienced to know better.

But this statement does not mean that no such descriptive articles are of use or interest. Many descriptive articles are well worth while. The engineer who desires to keep abreast of the times wants to know about the great and famous engineering works that are in the public eye—the Panama Canal, the electrification of railroads, the boring of large sub-aqueous tunnels, the Western irrigation works. Further, he must know something of the latest achievements of the profession in ocean navigation, in high buildings, great bridges, and in a hundred other directions. Not to know about such matters places him at a disadvantage in contact with the public and with his brother engineers, and he rightly looks to his professional journal for information.

It is to the descriptions of ordinary works that the statement of uselessness is particularly applied. It must be recognized, of course, that everyone is not familiar with these ordinary works and that while very few engineers ever get a chance to build a record-breaking skyscraper, many thousands are interested in the details of ordinary buildings. Therefore, details of typical works of ordinary size are useful to the engineer and they deserve a place in every high-class periodical. What is meant by descriptions of ordinary works may be more

apparent from the following quotation from a paper on "Power Plant Economics," published in 1906:

Three years ago the steam power plant for the generation of electricity had apparently settled down to an almost uniform arrangement of standard apparatus in which one power plant differed from another only in details of construction of engines, generators, and auxiliaries.

When the design of power stations or of dams or of any other class of engineering works becomes so standardized, there can be no excuse for loading up engineering journals with articles describing and illustrating works of the same sort, differing only in their geographical location.

In considering this matter of publishing descriptions of engineering works, too, it is often of interest to note the enormous change that has occurred in the last forty years. It is hardly so long ago as that the engineering works of magnitude were so few that it was practicable to have them all described in current engineering literature. The late George S. Morison used to publish a separate monograph for each large bridge he designed; and in that day, when literature of bridges of any sort was very scarce, they were prized by the profession. But nowadays there are hundreds of large bridges and other engineering works under construction all over the world, and life

is too short to read the descriptions of the fiftieth part of them, even if they were printed.

Engineering Problems. The idea which must again and again be impressed upon contributors is: "Don't describe engineering works, but describe the solution of engineering problems." The working engineer in the field or shop or office can seldom copy direct from another engineering work and would often be misled if he attempted to, since different conditions might prevail, but he can find help in the solutions of the problems before him by studying the solutions that others have used for similar problems. By engineering problems, however, is not meant mathematical problems. These have their own value and importance; but in the practical everyday work of the engineer, the problem of how to do a particular thing and to do it successfully arises forty times as often.

The distinction between the descriptions of works and of problems is thus explained in "Engineering News":

A certain locomotive has been built, let us say, and the firm building it furnishes us with drawings and a stereotype description, including a table of its principal dimensions. We publish it, very likely, in the absence of anything better. Suppose, on the other hand, the man responsible for the design of that locomotive sits down and tells a story of a different sort. The locomotive, it appears, follows ordinary practice in

its design, except in its firebox. It was desired to use a certain kind of coal, which gave trouble in certain specified ways, and the problem was, how to make a firebox to burn this particular kind of coal; and then he tells us in detail how the peculiar shape and size of the firebox were developed, keeping in mind all the time that only that part of the problem's solution is worth record in technical literature which will be practically useful to his brother engineers who have a similar problem to solve.

That, in a nutshell, is our idea of the most useful class of technical literature, and contributions along these lines always find a welcome in these columns.

Then the commercial problem is one of those most frequently presented. It is not only how work can be done successfully, but how it can be done at least cost, that the engineer has to decide; it is the business of the engineering journal to give him aid on tasks like these. In describing such problems, the question again arises as to how far to carry the description of the work. If the engineering work involves new problems of design, exceptional difficulties in execution, novel methods of work, then by all means write a description of them, and the writer must perforce put in enough concerning the whole work itself to make its novel features clear. It is not such descriptive articles that are condemned. It is rather the meaningless description of one engineering

work after another built on standard designs throughout, with perhaps just enough difference here and there to give the semblance of an excuse for foisting it upon the patient reader under the guise of engineering literature. If the writer for the technical press will put himself in the place of the reader, and try to imagine just what the reader will want to know, he will find his task simplified; particularly so if he is able to gage the wants not of one reader but of a thousand readers who are in search of help in their work.

Construction Details. At the same time, it is not necessary that writers on engineering construction should always look for, and choose to write on, details about what is "out of the ordinary" and leave the ordinary unwritten. Let anyone scan with care the indexes to engineering periodicals and the statement will be apparent that, in general, the ordinary is in small proportion to the extraordinary. For example, select bridge construction—not design—and search through the columns of any engineering publication for the past decade or two. Many excellent articles will be found descriptive of difficult bridge foundation work and of caisson work in particular, also a considerable number of articles on floating bridges to place on scows, and many illustrations of ingeniously peculiar falsework. In fact, there is almost everything

under the sun except the description of the ordinary details involved in erecting an ordinary bridge under ordinary conditions, accompanied with data of cost.

It will likewise be difficult to find in all the range of engineering literature a good article describing how to erect a land pile driver, or how to erect and afterward shift a guy derrick, with details of the time and expense involved in such work. Turn from bridge building to trestle and viaduct construction and note what a dearth there is of information as to practical details—the how and the cost.

Turn again to rock excavation and a similar state of affairs will be found. On the most difficult class of rock excavation, namely, shaft and tunnel work, there are so many excellent articles written by engineers that one is at a loss which to read first—and when to stop reading. But let anyone seek to find an article descriptive of the spacing of holes, the charging, the firing, and the removal of rock from a sewer trench, with costs, and he will look long and almost in vain. Such work as this, which so many hundreds of engineers have seen, is by virtue of its very commonness, left undescribed.

Within the past few years a number of excellent articles have appeared on the methods and costs of concrete construction, but almost without exception the very important item

of forms has been ignored. Yet the economic success of reinforced concrete in building construction is very largely dependent on this very item. Excellent data have been given on the cost of making concrete itself, after the plant has been installed, but little has been said of the methods and costs of installing, shifting, and dismantling the plant. Such instances might be enumerated almost without end but this is sufficient to show that it is these very simple yet very important things that are so universally ignored.

An engineer need not be the chief engineer of a great work, and the work he is on need not be great, nor even unusual, to enable him to find subject matter for an excellent article. While general descriptions of great engineering works are interesting to all, they are of direct value to but a few readers, and the same holds true of work of an extraordinary character. On the contrary, however, an analytical discussion of common work really is most uncommon, yet by virtue of its uncommonness it is of great interest to a host of readers.

There appears to be a fear that to write of little things belittles the writer. No fear has less reason for existence. Some of the most celebrated engineers of today owe their celebrity in no small part to articles that they have written on the details of the construction of common things. A man who thus shows him-

self to be a student of details is inferentially regarded to be a safe man to be intrusted with the larger problems of engineering construction, which are, after all, little more than a vast assemblage of little problems.

Methods and Costs. In connection with this subject of engineering problems, there is probably none that gives the average consulting or designing engineer more trouble than in obtaining definite and desirable data that can be used with confidence as a basis for estimating the cost of work. Second only to the desire for accurate cost data, or, perhaps primarily, in the opinion of some, is the desire for detailed information regarding successful methods of executing work; methods that have saved expense, saved time, safeguarded life and facilitated constructive operations. This is especially the case where, as not infrequently happens, an engineer is called upon to work in a field with the details of which he is not thoroughly conversant, when, manifestly, he cannot rely on his own experience, but must seek that of others. His first recourse is to the various technical periodicals and society transactions, and his usual method is to begin a search through these to find what his brother engineers have put on record, and usually, as shown above, with very indifferent results.

Why, in these professional papers and arti-

cles in the technical journals, are the vital details of methods and costs omitted? Presumably the engineer and the contractor consider this information, often the accumulated result of many years' experience, as one of their chief assets and an important feature of their "stock-in-trade" on which they base their reputation and consequent practice. On the other hand, it is altogether probable that in many cases this policy of secrecy regarding prices to which so many firms tenaciously adhere, is really based on nothing more than tradition, and that the publication of prices would react to the benefit more than to the injury of the engineer and the contractor.

The need of all available information of this character is evident. The engineer or contractor who is called upon to furnish an estimate for a given engineering work must know what such a piece of work will cost to perform in order to make a bid which will yield him a fair profit, but which will not be so excessive as to lose the job. Then, as to methods, while all information regarding them is of value, the facilities for performing the various operations as well as for handling materials, are constantly undergoing such radical changes that much that was of use on older works is now out of date. It is almost unnecessary to say that every piece of engineering or contracting work

is practically a problem calling for individual solution.

Recognizing, then, the scarcity of methods and costs information and the need of it, and the fact that there is plenty of it among the private papers of engineers and contractors, why is there so little available? One reason is, as mentioned above, that it is regarded by some as their professional "stock-in-trade." Another reason is the assumed objection on the part of a superior to having an assistant describe a piece of work, and publish the cost figures, an objection based, in the majority of cases, entirely upon traditional business policy. In such a description, the employee naturally refrains from anything that might be considered by his employer as revealing private information, and where there is any doubt in question, he will omit data merely on the chance that it might be objected to or will get special permission for its inclusion.

A third reason for the omission of cost data is the failure on the part of many engineers to comprehend the usefulness of such data to other engineers. Many engineers when they sit down to write a professional paper undertake the work from the wrong point of view and give merely the useless and little-desirable description of a given piece of work, instead of subordinating this to the main purpose of recording those facts and figures which will be

of direct practical use to other members of the profession. These facts should stand out prominently and not be buried in a mass of descriptive matter. On the other hand, there should be sufficient literary excellence to prevent the paper from becoming a dry recital of facts and figures and making it far less instructive than would be the same or even less information presented in such a manner that it compels the attention of the reader and impresses the salient facts upon his memory.

Of these possible reasons for the scarcity of methods and costs data, the most important is the first; but taking all in all, a knowledge of costs is only one of the qualifications needed by a successful contractor and is probably the one of lightest weight, but one which he often considers the heaviest. He overlooks or underestimates the qualities he possesses which he cannot pass on—his knowledge of when, where, and how, to obtain capital with which to operate and where to secure bondsmen; his business ability and knowledge of how and where to buy; his knowledge of human nature; his power to organize and discipline his forces to secure efficient and harmonious work.

The day of secrecy in connection with technical matters has very largely passed, and it may not be out of place to quote that well-known comment of Francis Bacon: "I hold every man a debtor to his profession; from

the which, as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends to be a help and ornament thereunto."

Special Subjects. The choice of a subject naturally depends upon the writer's interest in it and his previous information or experience in regard to it. In his treatment of a subject it is not necessary that the writer depend on himself. He may make a special study of a certain phase of engineering work or study and collect data concerning the labors of others from all available sources, but he should supplement this with the results of his own study. He must put original thought and work in his article and not make it merely a patchwork of other people's ideas. In this way much valuable work may be done in engineering literature, as, for example, the treatment in an exhaustive manner some years ago, by a series of articles in "Engineering News," of "Stand-pipe Accidents and Failures."

The author, Prof. Wm. D. Pence, collected all possible information bearing upon this subject, and, resisting the temptation to publish a general treatise on stand-pipe construction, he thus made immediately available an historical record of stand-pipe accidents and failures as a whole and stand-pipe failures in general. Every busy engineer who has attempted to

secure exhaustive information on almost any engineering subject knows that most of the books from which he expects help contain only sketchy presentations of the subject he is investigating, owing to the fact that in trying to give a little of everything the authors lack space, or knowledge, to give everything of something. Turning to the technical papers as must almost invariably be done to secure the nearest approach to the whole and the latest of the available information sought, it is found that the information here is widely scattered, as it must be in this age of progress. It is mainly, therefore, to exhaustive treatments like that of Prof. Pence that one must look for anything like an adequate presentation of a special branch or phase of engineering, or indeed of any other science.

It may be complained that I have treated this subject at too great length—this may be, but I feel that the importance of the subject, and its treatment, as the fundamental considerations in engineering literature, should be so impressed on the writer that he will give it careful thought instead of rushing into work on a manuscript that is doomed to failure from its inception.

In the last analysis, engineering literature is the work of the engineering profession. If it is to be made better and more useful by following out the lines here indicated, the work must

be done by the engineers. The technical journal is a co-operative exchange. If the practicing engineer looks to it for aid in his work, he ought in turn to impart from his own experience for the benefit of other members of the profession. The general adherence to the character of articles described might aid those who would thus contribute to the general fund of knowledge in a way that would be of the greatest benefit to all.

VIII

COLLECTING AND ARRANGING MATERIAL

The collecting of ideas and material, and the arrangement of this material in the final form of a literary production must each be considered as a process in itself. The writer or speaker who writes or speaks *impromptu* has to perform a five-fold task; he must collect, select, proportion, arrange, and express his ideas simultaneously. Some men can do this. An experienced editor often gives "copy" to the printer just as he writes it. Men who are accustomed to debate or speaking in public soon acquire the faculty of thinking while on their feet; they can extemporize volubly on almost any subject and for almost any time, but it is seldom that such productions, transformed into paper and printer's ink, could be regarded as good literature. As a typical illustration of this, read a speech as literally reproduced in the Congressional Record.

Scholars and literary men often deliver short "extempore" speeches that prove most readable because they are always ready to be called on; they know from intuition and training what is best suited to their audience; they

know that simplicity is the soul of style in spoken as well as in written thought, and they adapt their discourses to the conditions. But back of the seeming "extempore" address has been thought—prevision and provision; provision of material and prevision in arrangement, against the ever possible emergency of a "speech" call. Most speeches, however, require careful and extensive editing before they are suitable for printed literature.

The first step in the preparation of any literary production, after the subject has been decided upon, is the collecting of material. In an article giving the results of original investigation, the material would naturally consist of notes representing the thought and experiences of the writer, but it must not be considered that all literary productions are, or should necessarily be, entirely the original work of the writer. This is very seldom the case. Technical journals, society proceedings, and such publications may, as already stated, be considered as a co-operative exchange in which are first recorded the results of original research, discovery, and invention. Men have many and various motives for writing and speaking, and the best of the material thus produced ultimately finds its way into print. This, with notes of unpublished addresses, etc., forms the material, other than that of his original thought, that is available to the tech-

go to strange place with his eyes shut, or visit a new piece of work without noting all that strikes him as peculiar and important. The man who learns to carry a mental notebook or jots down these items in his memo book or on cards will have little difficulty in finding material, and new subjects worth writing about will often spring up in the least expected places. The life and work going on about us is our first source of ideas; the second and scarcely less important is the field of literature itself. A noting of items of information of what is taking place in the world as it appears in newspapers and magazines will give much material. To a writer all these facts and ideas are of use; they should not be thrown away; they should be sifted, digested, selected, and preserved for future reference.

When the material has been selected, it must be arranged, and otherwise prepared for publication. A good book does not consist merely of a compilation of material and statement of facts, however accurate those facts may be. It is necessary that the material be presented in logical order. I do not say the "best" order as there is probably no "best" arrangement. There may be a best possible, considered from the point of view of each particular set of readers; there may be a best possible considered in connection with the aims of the writer, but there can be no "best" arrange-

ment of any particular subject to suit all classes of readers, and opinions of individuals, and at the same time to meet the particular object the writer had in view. But there can be a "logical" arrangement.

The matter of arrangement is important, as on it depends the success of the book, almost as much as on the material itself. It, in turn, depends on the ability and judgment of the writer. The study of the arrangement of works of a similar nature by other writers will greatly assist. It is not necessary or advisable to adhere rigidly to any one of these existing arrangements, but as thought has presumably been expended on them, they will often give valuable suggestions regarding the relations between subjects, and also serve as a warning against possible errors. Time spent on arrangement of material is time well spent. The same principle of arrangement—method, system—operates throughout our lives in all departments of work. Have you ever noticed the arrangement of the parts of a machine, packed for shipment; how hundreds of pieces and made-up parts are packed for shipment in three or four cases, the whole small in comparison with the built-up machine? The various parts are fitted together; one inside another, a bent piece fitted around other variously shaped pieces; flat pieces tied in a bundle—and all in such order that much time is saved

in the erection of the machine, space in storage, and expense in shipment. Similarly, by a logical arrangement of the text of a book, there is a saving of space and expense to the writer and time to the reader.

Some literary works fail from lack of a logical plan; others because the plan was faulty. The chief faults in plans of books or papers lie in their incompleteness; the lack of unity, proportion, interest, and cohesion; the misuse of quotations, and in the careless method of arranging the material. The outline plan should be as complete as possible—none of the topics to be treated should be omitted. There should be unity—stick to the subject and avoid digressions. There should be proportion—this depends largely upon the final expression but also much upon the arrangement of topics; what is important should be brought forward and what is relatively unimportant should be retired to the background. There should always be interest—one writer may produce a book containing a valuable record of facts and experience, but written in a style about as readable as the Patent Office Gazette or the Census Report, while another writer may present practically the same facts in a style as readable as a book of fiction. This should also include appropriateness—often there is introduced into a book a class of material that has some relation to the subject, but which may

not be appropriate to the class of readers for whom the book is intended. There should be cohesion—logical order and smoothness in development. In the use of quoted or adapted material there are many things to be considered. Primarily the writer must himself thoroughly understand all the definitions and points brought out by his authority in order that he may avoid ambiguity or obscurity in his own work. He must also consider the aims, prejudices and faults of his authorities; their lack of method, proportion, etc.; their omissions and lack of judgment, and further back still, the faults and omissions of the authorities to whom they referred. This should impress on writers the point, in the collection of material, of noting their authorities, and giving proper credit, as treated on page 173, so that investigators can trace important facts and figures back to their original sources.

The importance of great care in the use of collated matter may be judged from the following paragraph, quoted from a book review in "Engineering News."

"The preparation of text-books for schools ought to be regarded as a very serious business. They plant seed in a virgin soil and that seed ought to be very carefully selected and free from tares. What the pupil learns from his text-books is likely to be tenaciously held in the memory and difficult to uproot. Their authors should, therefore, be particularly careful

that the matter should be carefully selected, the statement of facts and principles adequate and accurate, and, in technical and industrial matters, the latest and best accepted theory and practice should be presented."

In the arranging and final preparation of the material, different methods are used by different writers; every writer has to find out by experience what method is best suited to him and his class of work. In general the use of index cards is much to be preferred to paper in making up the plan of the book. If the topics are recorded on index cards, they can be arranged and rearranged as desired and proportioned under headings and sub-heads, and sub-sub-heads, until a logical general plan of the work is drawn up, which may later be amplified as desired. The use of cards in this preliminary arrangement is of great assistance to the writer in his later writing by holding him to the topic before him and preventing his flying off on a tangent into other fields of thought. He need not fear forgetting the other topics, having them permanently recorded and arranged; and in case of new ideas coming to him, he can record them on cards—and forget them until he reaches their proper places.

When the material to be used has been selected, it may be written out in the form of paragraphs upon separate sheets. These sheets

may then be arranged in order according to the card record plan of the book and thus form a skeleton of the text, which may be amplified or condensed as desired and finally edited for the printer.

In regard to the final writing of original material the present writer has found that instead of trying to write out at once the matter in complete and final form, it suits him better to write it first in outline, by notes, jotting down at random as few words as may be necessary to describe an idea relating to the particular topic in hand. Later the words recall the ideas and these notes are expanded upon as may be necessary to express the ideas in full. In making this first complete draft, merely a general connection of ideas is wanted, with little regard to the best words or forms of expression; no corrections are made in the writing and frequently an idea is expressed in two or even more different ways. In this writing each particular heading as represented on a card is isolated and treated exhaustively without any consideration of its connection or relationship to other headings or topics, thus preventing as far as possible the distraction of thought that must come if connections or relations between headings are thought of at the same time the writing is done.

When this complete, and more or less connected, draft has been made (and written with

wide spacing) it is followed by a careful perusal for improvement in wording and expression, and the draft thus improved as a literary production, is then "edited" for the printer, according to the general principles given in Chapter X.

One point that must be mentioned in conclusion is the free use of paper. An article may be a failure on account of a false economy in the use of paper in drawing up the incomplete or the complete drafts of the work. This is false economy, first, because paper is cheap, and secondly, because its consideration is always of far less importance than time, mental labor, eyesight, and satisfactory results.

AIDS TO LITERARY WORK

There are many aids available to the man who is literarily inclined, which the special character of his work will bring to his attention, but among the most prominent aids in general writing and speaking may be mentioned the following:

Good memory (see page 94).

Knowledge of shorthand:

The ability to write shorthand will often be found useful in taking notes of addresses, lectures, etc., as well as of ordinary conversation; in aiding the memory in many ways; in making notes for reference in speaking, to occupy small space; in noting the points of an adversary's

argument in debate, etc. The art can be readily mastered by any person of fair intelligence, possessed of patience and perseverance and a desire to learn.

Pocket note-book or memo cards.

Good book of synonyms:

There are many such books, but Roget's "Thesaurus of English Words and Phrases" is probably as good a book of this kind as can be had.

Reference books of quotations from standard authors.

Standard up-to-date Encyclopedia.

Unabridged Dictionary:

The "Century" and "Standard" dictionaries are the standards in most publishers' offices.

Text-books of Rhetoric, Grammar, Punctuation, etc.

Reading of Classics, etc. (for style).

Listening to lectures, etc., by prominent speakers, and taking notes.

Making outlines, abstracts, and summaries of books and articles.

Almanacs, etc., giving volumes of facts.

IX

EXERCISING THE MEMORY

On pages 23 and 92 "memory" has been referred to as a prime essential to success and as the first of various aids in literary work. There is no other human faculty of such importance to success in any branch of endeavor as memory, and this is particularly so in the work of the engineer, who must, by the nature of his professional employment, be conversant with many facts, details, and data on a great variety of topics. On account of this importance of the faculty of memory, the following notes have been introduced, but I do not wish them to be construed as a "system" for the cultivation of memory. In the limited space of a few pages, no "system" could be given, even in outline, to be of value beyond that of suggestion. I, therefore, make no pretensions for these notes beyond their suggestion as an "exercise" of the memory. There are several "systems" taught, by as many different teachers, and they all may be worthy of study. I have neither studied nor investigated any one of them and cannot, either from experience or knowledge, recommend any particular one, but in general, would recommend the consideration, at least, of any system that tends to cultivate an assimilative, or natural, memory. In these notes, I have tried to explain some principles on which memory is based, and to suggest a method of using these principles as an exercise, which, if applied with care to the reader's work or study, will result in an almost immediate quickening of the very important faculty of memory.—H. F.

What is "Memory"? It is defined as "The mind's faculty for connecting its past experience with its present self" and as "The faculty of retaining representations of whatever has once been in consciousness." When this fac-

ulty is exercised involuntarily, it is "remembrance"; when occasioned by the exercise of will, it is "recollection." Without this faculty the past experience of the individual or the race would be a blank, and all knowledge would be limited to the present moment. It is the very basis of knowledge, and its value, therefore, cannot be exaggerated; neither can its possibilities be overestimated. It is a faculty that is as subject to development by proper exercise as is the body. Nothing can be so strengthened by practice or so weakened by neglect, and since the most ancient times, devices and systems have been invented both to assist the power of recollection and to develop the natural faculty of remembrance. A perusal of almost any one of the popular magazines of today will show that various systems are still taught and that they have been applied to the modern method of teaching by correspondence.

Devices to assist recollection are known under the general name of "Mnemonics"—the art of assisting recollection by methods of association. The common aim of mnemonics is to associate the thing to be remembered with something which it is thought can be more easily recalled. The common method of tying a string around a finger to remember to buy something or to post a letter, is such a device; so is the transferring of a ring from a finger on which it is customarily worn to another

finger unaccustomed to the feeling of a ring, on account of which the matter is constantly brought to the mind. There are many other devices that are familiar to almost every man, one of the best known being the old "Thirty days hath September" rhyme for remembering the number of days in each month.

These are very common and elementary forms of mnemonics, but is it not too often the case that even with the simple device of a string on the finger, while the attention is later directed to the **device**, the **fact** which was intended to be brought to mind cannot be recalled? This shows the weakness of the artificial method of recollection, and that the dependence of the recollection upon the law of association only, is of little practical utility. It is, however, of some service when certain devices are regularly used in connection with certain definite facts, but in the use of any of these artificial or arbitrary methods each mind should note what sort of associations are most facile to itself and should use them in its own way. Notwithstanding, however, what might be said in its favor, mnemonics is not an **exercise** of memory and it compels a double duty on the senses in that the device itself must be recollected before the fact is recalled.

Look again at our definition of "memory"—
"The mind's faculty for connecting its past experience with its present self." We are said

to "remember" a thing when the idea arises in the mind with a consciousness at the same time that we have had this idea before. Dr. Watts, in his essays on "The Improvement of the Mind," says: "Our memory is our natural power of retaining what we learn, and of recalling it on every occasion. Therefore we can never be said to remember anything, whether it be ideas or propositions, words or things, notions or arguments, of which we have not had some former idea or perception, either by sense of imagination, thought or reflection; but whatsoever we learn from observation, books, or conversation, etc., must all be laid up and preserved in the memory, if we would make it really useful." It will be seen then that memory involves two periods: the past and the present, and that it also involves a third stage—"The mind's faculty for connecting"—"The faculty of retaining representations of whatever has been in consciousness." Consider, for example, your trip to Europe or your visit to a steel works. Your mind was impressed with the vastness of the ocean, the life of the people you met, the buildings, and the customs of the foreign countries, etc., or in the case of the steel works, with the various exciting details in the manufacture of steel, the fire from the converters, the rolling of the blooms, the roar of the hammers, etc. Later you want to tell some one of your experiences. You cannot

see the ocean, the people, or the buildings; you cannot hear the roar of the steel works or feel the heat of the furnaces; yet you can convey an idea of these things that have been in your experience in language, more or less clearly, according to the impressions they made upon your mind and your power of reviving the impressions. The language in which you express your thoughts has also something to do with your description, but while this has not in itself any relation to the incidents you are describing, it does depend upon your memory of words, etc. Memory consists of three stages: first impression, preservation of the impression, revival of the impression when wanted. Memory will depend primarily upon the first impression, as without that there is nothing to be preserved or revived. The common phrase, "It made no impression on my mind," will have a new meaning when seriously thought of in connection with these three stages of memory.

A **good** memory will (1) receive with ease strong impressions of words, objects, and incidents; (2) store the impressions in great quantity and variety; (3) retain the impressions for a considerable period; (4) revive the impressions strongly and promptly when wanted. At the same time, a memory may be good as concerns first impressions, but poor as concerns its power of preservation and re-

vival. Or *vice versa*, the power of revival may be strong, but the mind may not readily receive or preserve impressions. This is often noticeable in cases where a student "crams" the night before an examination and forgets everything in a few days after the examination. By thus forcing impressions on the mind one idea effaces another. Don't cram.

Any one or all of the above qualifications of a good memory may be improved by exercise, or injured by neglect. It is a good exercise for the revival of impressions, to take a short time daily and think over something that has passed—try to recall to mind faces, buildings, incidents, or the substance of what has been read. It will be surprising how quickly this simple exercise, systematically practiced, will strengthen the powers of recollection. But behind it all is always the first impression. The strengthening of that will, in turn, strengthen the other faculties. But how can it be strengthened? By exercise. The reader knows, as a mere matter of fact, that first impressions of anything in which he is really interested are stronger than those of anything in which he is not interested. Strengthen impressions, therefore, by cultivating interest—in everything worth remembering.

James Russell Lowell says, in regard to reading: "The moment you have a definite aim, attention is quickened, the mother of memory,

and all that you acquire groups and arranges itself in an order that is lucid. * * * also forces on us the necessity of thinking, which, after all, is the highest result of all education." Those words contain the true secret of memory—aim, attention, thinking. As all roads lead to Rome, so they lead away; as interest may be directed toward anything, so may it be diverted, which is mind-wandering. The opposite of mind-wandering is attention—the **steady** application of the mind. It is a direction of the intellect by the will, actuated by an aim.

But you may want to learn a certain fact, a formula, a telephone number, a definition, or a man's name. You have an aim in learning it. You repeat it a dozen times or more—and forget it in less than twenty-four hours. Why? By trying to learn it by a wrong method, by rote, mere repetition, "in one ear and out of the other." You may have tried hard to remember and given it due diligence, but what was lacking was thought—reasoning. Nothing cultivates mind-wandering so much as repetition, or reading without thinking. Thinking, as Lowell says, "the highest result of all education," is the basis of memory. By thinking, we deduce inferences from facts or propositions; by thinking, we find resemblances to, and relations between objects. We are told that one building is fifty feet higher than an-

other, and we realize the relative proportions by an unconscious process of reasoning—comparison. We often say of a person: “He reminds me of a friend”—a case of similarity involving thought. These and many other matters of every-day occurrence, in which we are aware of no special process of reasoning, are in fact, based on the faculty of thinking.

To think intelligently and systematically, it is necessary to know something of the underlying laws of thinking. To go into this in detail would necessitate an essay on “Reason,” but as the present purpose is merely to suggest an exercise, we may say that the general principles of thought are much the same as those of “figures of thought,” mentioned on page 24, in connection with rhetoric: Similarity, Dissimilarity, and Association. We may go still further, and under these heads, classify the various figures of speech and thought, and apply them to the art of thinking, or of finding relations between objects.

1. The principle of Similarity:

Alliteration—a relationship of sight,
as

“Tongues in trees, books in babbling
brooks, and sermons in stones.”

Paronomasia—a relationship of sound,
as, telegraph—telephone.

Simile—an expressed comparison, as,
The brotherhood of the profession.

2. The principle of Dissimilarity:

Contrast and Antithesis—implying opposition, as, high—low; new—old.

Under 1 and 2 combined is Synechdoche:

Concrete and abstract—similar quality in adjective and noun, as, concrete—strong; rubber—elastic.

Genus and species—an individual of a general class, as, tree—pine; animal—dog.

3. The principle of Association:

Cause and effect—lightning—thunder.

Container and the thing contained, or whole and part, as, Locomotive—boiler.

Sign and the thing signified—crown—monarchy.

Author and his works—Gillett—Hand-book of Cost Data.

How can these principles be applied to our daily work? Their understanding will give us a basis of thought, of finding relations between things unknown that we wish to learn and remember, and things already known. It will enable us to proceed intelligently from the known to the unknown, and to fix that in memory; to retain what has been mastered before advancing to something new. By thoughtful application of these principles, they will gradually become assimilated with the very acts of reading, conversing, and doing, until they are unconsciously applied to everything we do. By a slight reflection, almost every one will find that these principles are

already unconsciously applied—we remember many things by their relations to other and better known things. But as an example, in a simple form, read over the following words, starting and ending with the one now in the mind—memory:

Memory, emery, rough, ocean, steamship, Mauretania, large, small, village, London, Bank of England, savings, economics, Wellington, Napoleon, finance, railroad, canal, tow, propel, power, official, Washington, father, son, bright, learning, memory.

Without any special consideration of this list of words, it would require considerable repetition before they could be repeated freely and quickly, forward or backward. But it will be found, when the words have been repeated, even once, with thought of the relationship existing between them, that they can be recalled with little effort. For instance, read them over in this way:

memory

similarity of sound

emery

concrete and abstract; emery is usually rough

rough

association, as the ocean is often rough

ocean

association

steamship	genus and species; there are many steamships of which this is an individual
Mauretania	concrete and abstract, as everyone knows that the Mauretania is large
large	antithesis
small	concrete and abstract
village	contrast—a village is small but London is a large city
London	whole and part, as the Bank is in London
Bank of England	cause and effect; the bank is both the cause the the result of saving
saving	cause and effect; saving is the effect of economy
economics	author and his work; Wellington's book on "Economic Location of Railways" is generally known merely as "Wellington"
Wellington	association
Napoleon	association; a man is sometimes spoken of as a "Napoleon of finance"

finance

association; railroads require financing and the terms are often used together

railroad

contrast

canal

association, as canal boats are towed

tow

antithesis; towing and propelling are the two extremes

propel

association; it requires power to propel a thing

power

sign and thing signified; an official is the representative of power.

official

association between the officials and the capital of the country

Washington

simile; "The father of his country"

father

antithesis

son

concrete and abstract; the relationship formed by an implied, but not expressed, relationship of sound between son and sun

bright

concrete and abstract; a
person who has learning
is considered bright

learning

cause and effect; learning is
a natural result of mem-
ory

memory

It will now be found that, without any further resort to the list, these words have so impressed themselves on the mind through their relationships, that they can be repeated backward almost as easily and quickly as forward. The words of this list were selected in order to illustrate the relationships described, but the principle may be extended by practice to phrases, sentences, paragraphs, and chapters, in reading, so that a logical sequence may easily be kept in mind; and in speaking, so that little or no recourse need be had to notes. If the matter has been logically arranged, these divisions can be reduced to keywords which may be linked together by a chain of related words.

A list of words, or subjects, or thoughts, that are unrelated, may be thus connected by a chain of related words, as for instance, the following order of a classification of engineering subjects:

Natural Sciences—science and art—**Arts**—

Industrial Arts—fine arts—mine (relation-
ship of sound with fine)—**Mining**—

Mining and Metallurgy—minerals—iron—
steel—**Strength**—

Strength of Materials—**Drawing Materials**—
Drawing and Machine Design—design—plan
—building—**Wood**—

Timber and Wood Working—**Working**—

Metals and Metal Working—manufacturing
—**Mill**—

Mills, Factories, Shops—**Heating of shops**—
Heat and Fuels—fire—boiler—**Steam**—
Steam Engineering—engine—**Power**—
Power Transmission—transmission of **Elec-**
tricity—

Electrical Engineering—electric **Railways**—
Railway Machinery and Equipment—sup-
plies—for steamship—**Marine**—

Marine and Naval Engineering—warfare—
Aerial warfare—

Aerial Transportation—transportation of
troops—**Military**—

Military Engineering—army—navy—water
—**Hydraulic**—

Hydraulic Engineering—water supply—for
towns—**Municipality**—

Municipal and Sanitary Engineering—sani-
tation of buildings—**Structures**—

Structural Engineering—erection—design—
Architect—

Architecture and Fine Arts—paintings, stat-
uary and **Miscellaneous works of art**—

Technical Miscellany—odds and ends—contrivances—**Inventions**—

Inventions, Patents, Law—professional work—**Medicine**—

Medicine and Surgery—the body—the mind—**Philosophy**—etc., etc.

This chain method of assisting the memory will find a parallel in the repetition of a poem, for example. No matter how well one may know a poem, if asked to repeat the third verse, he would hesitate, but if he repeated the poem from its commencement, there would be no hesitation. It is merely the advancement from the known to the unknown, the suggestive power of what is in the mind to what immediately follows it, the mutual dependence of things on each other.

In regard to numbers, dates, and other facts involving the remembrance of figures, the principles of relations may also be applied, but in a little different form. This may be illustrated by taking, for instance, the figures of the recently completed census. The population of the United States and its territorial possessions is given (1910) as 93,346,543. How may we fix this number in our minds? The following might be the general order of reasoning:

1. We know that it is in millions and somewhat less than the complete hundred million. Therefore there are eight figures in the number. Divide these into three divisions repre-

senting the hundreds, thousands and millions, as 93|346|543, and look for relations between the divisions, first.

2. We see that there are three 3's, one in each division. It is also seen that the sums of the figures in the different divisions are 12, 13, 12. Taking the first division; there are two figures only, one of which is 3, and the sum is 12, therefore the other must be 9. This places the millions at 93. Then taking the third division, which has the same total, 12, we see that it, just as the first division, ends with its 3. The other two figures add to 9 and may be 90, 81, 72, 54, or the same numbers reversed. It is 54, a combination which makes with the last figure, a sequence reading from right to left, the right end being the known figure.

3. Now, consider the thousands division and note its relations to the others. The sum of the figures is 13, one of which is 3, leaving a possible combination of the others in order to make 10, of 91, 82, 64, or 55, or any of them reversed. Compare this division with the hundreds; one commences with the 3 and the other ends with the 3; carry on the sequence of the last division and we get 6 for the last figure of the second division, and the middle figure, therefore, must be 4, which is also the middle figure of the last division. Again, comparing the first and the second divisions, we see that the two 3's come together, also that the sum of the first and last figures of the second division equals the other figure of the first division.

This reasoning is given here in detail, but with a little practice the powers of observation are so quickened that the relationships are al-

most instantly seen and in taking up any set of figures, the mind will instinctively look for them, and fix them in memory. The number is then remembered not as so many arbitrary figures, but as a lucid grouping, and in future revival of the impression, any one figure will recall all the others in their proper order, one after another, until the group is complete. It will surprise one who has not thus thought of numbers, to observe how relations may be established between the figures of almost any given number of four or more figures.

Consider, for instance, the populations of the three American cities having over one million inhabitants—New York, Chicago and Philadelphia:

New York—4,766,883. Note the arrangement of double 6's and 8's—the sum of the first and last figures equals the second figure—the second and third divisions each total 19.

Chicago—2,185,283. Note the arrangement of the 1, 2, 3—the difference between the first and last figures of the third division equals the first figure of the second division, and the sum of the same figures equals the last figure of the second division—and the middle figures of these two divisions are the same.

Philadelphia—1,549,008. Note the relationship of the 9's—first and last figures equal 9—first and second of the second division equal 9, which is the other figure of this division—and total of all figures equals 27, 9 times the number of divisions.

Other relations will easily be found, but this will be sufficient to indicate the character of the relations that exist between figures, the observation of which will assist in the study of even the most mathematical works.

This underlying principle of the mutual dependence of things on each other, and observation of the most prominent features, will assist in the recollection of a man's name from his style of dress, his size, appearance, office or employment; the name of an author from association with the title or character of his books; a date from association with something connected with the incident, etc. The association of ideas is of great importance and its practice will make it of valuable assistance in learning anything, but it does not do away entirely with the necessity of making written memoranda. Use these to save the exercise of the mind on the non-essentials, and back them up with the brain's record of the unchangeable essentials—first making sure that these essentials and the relations between them are thoroughly understood, and are not stored away as a heap of facts without connection or order.

X

PREPARATION OF MANUSCRIPTS FOR PUBLICATION

The vast quantity of new material on technical subjects constantly appearing in the form of books and periodical articles is evidence of a growing tendency on the part of engineers toward literary work. Yet it is a fact that not one-half of the manuscripts submitted to publishers are accepted and published, and it may also be noted that a very considerable portion of these offerings are the first efforts of their writers in this particular form of composition. Some manuscripts show that much time and pains have been taken in their preparation, but a lack of acquaintance on the part of their writers with the elementary details of the publishing business renders these efforts ineffectual, and results either in the rejection of the manuscript or in the necessity of editorial revision and a consequent delay in its publication. On the other hand, some of these manuscripts are little more than hastily-written texts carelessly thrown together, with a bundle of crude drawings, which certainly does not complete the initial stages of a book, nor form a welcome

contribution, from the publisher's point of view.

These facts show the desirability of an explanation of some of the principles that should govern authors in the preparation of their manuscripts in order that they may gain literary recognition and that the profession may benefit by the information they convey. Before a manuscript is turned over to the printer it must have a title page, a table of contents or chapter heads, a copyright entry, a preface or an introduction, or both, and a list of illustrations, if they are of sufficient importance to warrant it. It must be standardized as to typographical style, punctuation, capitalization, and orthography; paragraphs and other divisions, italicized words, and positions and titles for illustrations must be clearly indicated; chapter-titles, sub-heads, section or paragraph topics, head-lines or "box heads," etc., must be inserted, and last, but by no means least, after the book is in type and made up into pages, a full and intelligently-made index must be provided.

This work is known as "editing the manuscript." Besides these details it involves many others which necessitate a considerable knowledge of the technicalities of typography. It consists essentially of preparing the manuscript for the printer, that is, in preparing the "printer's copy," in which nothing must be

left to conjecture. The printer is expected to follow copy exactly, practically his only freedom of deviation being the correction of an obvious error in spelling, in the omission of a duplicated word, which has been accidentally left uncanceled, etc., and in the questioning of a wording or grammatical construction—the query to be answered by the author in the proof corrections.

Some publishing houses have their own established styles of typography and systems of orthography, etc., on which they insist, in order to obtain uniformity in all their publications, and in such cases, final “editing” is always done by the publisher. For instance, an author might write, “50-ft. span,” where the publisher’s rule is “50-foot span,” or the policy may be to print proper names referred to in the body of an article in small capitals, which would mean a double ruling under the name in the manuscript, for the guidance of the printer. This editing to conform with his established policy is a matter that the publisher expects and more or less of it must be done with every manuscript published by him before it is given to the printer. But the larger matters, correct spelling, the indicating of paragraphs, punctuation, etc., are not the duty of the publisher and they should be done by the author. Such editing is costly labor and where there is a large amount of it done

by the publisher at the request of the author, the cost must be eventually borne by the author, either directly by a cash payment for the time consumed, or indirectly, through the methods of payment of royalties. This expense, and the incident delays, correspondence, and misunderstandings can often be avoided if the author edits his own manuscript after the completion of the creative work of the text. Sufficient has already been said regarding the importance of punctuation, spelling, and grammatical construction, so that the following paragraphs may be devoted principally to giving a number of the more important principles involved in the preparation of the material for publication in book form, and taking into account the special class of readers for whom this information is intended, attention will be more especially directed towards compositions on technical subjects.

GENERAL PRINCIPLES OF WRITING FOR PUBLICATION

In preparing a manuscript for publication, care should be taken—

To put the name of the writer on the first sheet.

To use paper of uniform size.

To number each sheet consecutively.

To write on one side of the paper only, and across the narrow dimension of the sheet.

To allow a margin at the left-hand side of the sheet.

To write plainly with black ink or to use typewriting.

To space the writing for easy reading and editing.

To make **everything** understandable to all who are to handle the manuscript—publisher, compositor, proofreader and yourself.

As the manuscript will pass through many hands before the final proofs are corrected, it is well to select a paper of tough texture. White paper is always in place, but tinted papers—yellow, orange, or other light shades—are preferable, as they are better for the eyes of editors, compositors, proofreaders and others who will work over the sheets. A desirable size is $8\frac{1}{2} \times 11$ inches—the ordinary business letter-head size. A margin of $1\frac{1}{2}$ inches should be allowed at the left-hand side of the sheet, $\frac{3}{4}$ -in. at the top, and $\frac{1}{2}$ -in. at the bottom of the sheet. The sheets should be numbered consecutively* in the upper right-hand corner, and the author's name, or an abbreviated title of the book may be written on the upper left-hand corner—but this is not an essential. Should it be found necessary, after writing a part of the work, to insert any considerable amount of additional matter, this matter should be written on separate sheets and given the same page number as the sheet it supplements,

* Some writers and publishers prefer the numbering of individual chapters separately, in which case every chapter should have a key letter, appended to each sheet of that chapter (as, 1x, 2x, etc.) to prevent the sheets of different chapters from becoming mixed.

with an index letter, as 27A, 27B, etc. These sheets should be marked: "Insert at 'A' page 27," etc., and the position of "A", "B", etc., should be indicated on the original sheet. If a complete page, or series of pages, is taken out, the page or pages should be accounted for by marking either the preceding sheet only, or both the preceding and the following sheets. Thus, if page 18 was cancelled, page 17 should be marked "17-18", and the following page would be marked 19; but if a number of pages as 18 to 26, inclusive, were cancelled, page 17 should be marked "17-26" and page 27 should be marked "18-27."

When the manuscript is handwritten, black ink should be used—never use pale ink. It should, however, be typewritten, if at all possible—on one side of the sheet **only**. The cost of typewriting is usually about ten cents per page (8½x11 ins.) containing approximately 300 words, or only about \$30 for a 300-page octavo book, allowing 25 per cent. of the space for illustrations. It pays to go to this expense. In this form the writer is better able to revise and perfect his manuscript, including its arrangement into sentences, chapters, and parts; to indicate plainly the number and position of illustrations; and generally to present his material in such form as will reduce mistakes in typesetting and save time and expense in revising and correcting proofs. It

must be understood also that publishers, on receipt of a manuscript, refer it to one or more readers who are qualified by special knowledge of the subject treated, to render intelligent opinions as to the advisability of publication, and upon these appraisements, the destiny of the manuscript, so far as the house considering them is concerned, largely depends. It is, therefore, of great importance that all possible be done by the author to present his work in the most favorable light, as a carelessly prepared manuscript, though good in material, often repels by its very appearance. Typewritten matter possesses nearly all the advantages of a printed page, and can be read with a continuity of attention that is impossible to give to a manuscript in handwriting, however excellent the latter may be. And as it is this very uninterruptedness of consideration that is required for properly estimating the value of a text, anything that will tend to secure it, is highly advisable.

Nothing should be left to conjecture. Any part of the original manuscript that is heavily interlined should be rewritten, and in case of minor interlineations, care should be taken to insert them in their proper places in the body of the text, and **not** in the margin, as in the correction of proofs. It should always be remembered that original manuscripts are not to

be corrected with the marks used in correction of proofs, as given further on.

The sheets should not be fastened together with pins; if it is desired to fasten them at all, easily removable clips may be used, and the sheets of each chapter fastened together separately.

Finally, in sending the manuscript to the publisher, the sheets should not be rolled or folded. Ship them flat, with some stiff support, such as cardboard, in the package. Rolled packages are always difficult to open and it is almost impossible to make sheets lie flat after having been tightly rolled, and they are a nuisance to everybody who handles them. A small contribution to a periodical, consisting of two to ten pages only, might be folded **once**—but not rolled.

EDITING MANUSCRIPT FOR PRINTER

These general principles might be supplemented by some more specific directions for the preparing of "printer's copy" after the original work of writing the manuscript has been completed. It has already been said not to correct the manuscript as a proof. "Correcting" and "Editing" are different. Editing consists in the final preparation for the printer and it is important that this is properly done. One of the most costly items in bookmaking and one that seriously affects the profits, is

that charged to "Author's Alterations," which are due mainly to improper or careless editing by the authors. It is the custom of all publishers to apportion the cost of corrections in the proof between themselves and the author. This must be done to protect themselves from the excessive alterations made by some authors when they see their compositions in type, which would amount, in many cases, to the resetting of practically a whole chapter, or even of the entire work. This apportionment is made by a provision in the contract as, for instance:

Any alterations made by the author after the work is in type, which exceed ten (10) per cent. of the cost of composition, shall be at the expense of the author.

The cost of correcting errors of composition is never charged to the author; the compositor is responsible for these and corrects them at his own expense. But it will be found that, unless a writer has had some of this costly experience, the expense of alterations made by himself will accumulate faster than he expects. This work is not charged for at the same rate as the original composition, but at a rate per hour for the time used in setting up the new material as well as in resetting old material made necessary by the alterations. To keep down this expense, the author should give attention to every detail and make his manu-

script as nearly perfect as possible before it goes to the printer.

Author's alterations made in "galley-proof"* involve resetting one or more lines only; in the "page-proof,"* they involve the same, plus the probable re-make-up of one or more pages; in the "plate-proof,"* they involve a cutting of the plate and insertion of the correction, with the consequent weakening of the plate, and often imperfect alignment in the printing, or it may involve the making of an entire new plate. These corrections can be made, but they should not be made, and almost invariably they lead to trouble.

To avoid author's corrections and obtain the best results from the printer, observe the following directions:

1. **Writing.** Write legibly. It avoids ambiguity and saves time of editor, compositor and proofreader. See that similarly written letters are not confounded. Be careful in writing "n" and "u", "a" and "o", "r" and "v", "m" and "w", and in the capitals "I" and "J"—the "I" is entirely above the line while the "J" extends half its length below it. When "l" and "t" come together, cross only the "t". Proper names should be **printed** to avoid incorrect spelling. Where mathematical expressions are employed they should be neatly

* The distinction between the various proofs is explained on page 277.

and correctly printed with a pen, which applies also to manuscripts in typewriting. Inferior and superior characters (exponents, subscripts, etc.) should be indicated in their proper positions and relative sizes. Confusion often arises from mistaking a hastily-written "1" for the minute sign ('), when used as a superior or inferior, and hurriedly dashed off letters such as "1" and "I" occasion vexatious delays and the re-reading of previous matter in order to find out whether they are or are not "7," or "1."

2. **Cancellations.** In the re-reading of a manuscript, cancel any illegible word by drawing a stroke through it or a letter by drawing a downward oblique line through it, and rewrite the word or letter directly above the cancellation, inserting a caret where the word is to be inserted, or if there are several words, indicate their position for insertion by a curved line—do not leave a word isolated among a lot of cancellations. If, after cancellation, you wish to restore a passage or word, underline it with a dotted line, and in the margin write *stet*, meaning "let it stand." Cancellations should be distinct—sacrifice neatness for legibility—make the compositor understand it, but be sure that you show clearly where the cancellation begins and ends.

3. **Transpositions.** If you wish to change the positions of two adjoining words, connect them with a curved line partly encircling

the words, and in the margin write "tr" (transpose), or you can effect the same thing by writing above the words, 1 and 2, to indicate their proper order. Whole passages may be handled in the same general way.

4. Capitals and Type Variations.—Commence every sentence with a capital. If you wish to capitalize a small letter, draw three short lines under it. Where a sentence has been broken to form a new sentence, instead of rewriting the first letter of the new sentence with a capital, it can be capitalized by this underlining. Two lines under a word indicates SMALL CAPS; three lines, FULL CAPS. One underlining indicates *italics*.* If a capital is to be changed to a small letter, cancel the capital, and in the margin write "l. c." (lower case). Italic capitals are indicated by four lines, or by the three lines and "itals." written in the margin. (It is to be noted that marginal notes are to be made opposite the word to which they refer.) Care should be taken in the proper use of capitals in names of persons and places, and in technical terms, where necessary. Formulas are almost always set in italics, and it is not ordinarily necessary to indicate this otherwise than by the character of the handwriting employed. But it insures a thorough understanding of this and also when

* In ordinary body matter use as few italics as possible, as many printers do not have machines equipped to set italics with other type and its insertion by hand is expensive.

isolated letters referring to such expressions occur in the body of the text, if they are underscored. A wavy line indicates **boldface type**, of which there are several varieties, and a double wavy line indicates **BOLD-FACE CAPITALS**.

5. **Punctuation.** Indicate commas, semicolons, and colons clearly, and draw a small circle around every period that ends a sentence; also wherever there is apt to be any uncertainty about the mark. Accuracy in the use of hyphens may be secured by using two small strokes instead of one.

6. **Paragraphs and Sentences.** In the manuscript, paragraphs should be indicated by indenting the first line about an inch—in printed form, it is indented about a quarter of an inch. If this has not been done in the writing, the paragraph can be indicated by using the sign (¶) before the word with which the paragraph is to commence, and underscoring the first letter for capitalization. Do not end a paragraph on the first or second line of a sheet; it is far better to squeeze the extra words or line on the bottom of the preceding sheet. Printer's copy is often divided among different compositors and this ending of a paragraph at the beginning of a sheet causes much annoyance. Divided words also cause trouble—compositors try to avoid cutting words at the end of lines by adjusting the spacing, and it

should be avoided in the manuscript as much as possible. When a paragraph indentation that has been made in the writing is to be changed, connect the end of the preceding sentence and the beginning of the paragraph with a line, or write in the margin "No ¶."

7. **Quotations.** It is customary to print quoted correspondence, clauses, or paragraphs in a different style from that used in the main part of the text. Sometimes the same size type is used, but set "solid", and sometimes a smaller type is used. This may be indicated in a typewritten manuscript by single-spacing the writing of the part quoted, and in handwriting, by a similar decrease in space between the lines. Another, and probably, the most approved way, is to draw a vertical line down the left side of any matter to be set differently, and the style or size of type to be used, indicated in the margin beside this line. Commonly a single vertical line indicates one size smaller type than the body of the text; a double line, two sizes smaller.

| It is customary, in all kinds of engineering construction, for the engineer to charge to estimates at the end of each month the quantity of material furnished on the ground and of work done. These estimates are approximate only and serve as a basis for making monthly payments to the contractor.

|| It is customary to reserve from ten to twenty-five per cent. of these monthly estimates until the final completion of the work. By means of these monthly payments the contractor is enabled to carry on the work to final completion with a much smaller capital than would be required if no payments were made until the work was finished.

To indicate the size and style of type properly may necessitate a knowledge of type (see page 266) greater than could be given here, but the lack of this knowledge can be overcome by marking "larger type", "smaller type", "set solid", "heavy face", etc., according to the writer's ideas, and as a rule, the printer will grasp the idea, and use a suitable type. The first line of a quotation is generally indented, and sometimes it is desirable to indent the entire quotation, in which case, write "**indent**" in the margin. In quoting one or more words, enclose words in quotation marks ("—"), and if quoting a misspelled word, or an expression in dialect, add a note in margin to "**follow copy**", otherwise the compositor may correct the spelling.

8. **Footnotes.** Footnotes are used to give credit to authorities quoted in the text, or to explain the meaning of some word, etc. In the manuscript they should follow immediately after the matter to which they refer—not at the bottom of the sheet. They should be enclosed between two lines drawn distinctly across the page, and referred to by a reference mark, as *, †, ‡.

* † ‡ Text of footnote, usually in smaller type than main text.

When the footnotes are numerous, they should be marked by reference numerals instead of marks, as ¹, ², and in technical papers,

where mathematical expressions are used, a half circle should separate them from the items to which they refer to prevent any possibility of their being mistaken for powers or other superior characters.

9. Chapter and Section Titles. All titles should be so indicated by underscoring, according to their importance. For paragraph topics "side-heads", in alinement with the first type line of the paragraph, are generally used, and are set in Italics, bold-face type, or small capitals. For example:

Two General Classes of Contracts. There are in general two kinds of contracts, namely: contracts made under seal, called **sealed** contracts or specialties **, and simple written or oral agreements unaccompanied with the formality of a seal, called **parol** contracts.

Sometimes the topics are set in a "box", as below. The "box-head" is more expensive in composition than the "side-head" and is used less. Where it is desired it should be indicated by writing the words of the side-note in the margin, or at the side of the text, where it is to be set, and surrounding it by a square drawn with the pen. Example:

At the present time there should be no difficulty in determining the relative values of stones	
	for road purposes in any locality.
Free	The Office of Public Roads of the
Government	United States Department of Agriculture
Tests.	undertakes to make tests and analyses of samples of stones, without charge, and to give advice as to their value for road-building purposes.

An even less common method is to print the notes in the margin instead of in the body of the text, and in line with the first line of the paragraph. This method is not common in books, but it is used to a considerable extent in specifications and in various forms of agreements.

10. **Illustrations.** These may be reproductions of photographs or line drawings, as desired. Where possible, proofs of illustrations to be used should be obtained and pasted in approximately their proper places in the manuscript. Where proofs cannot be had, leave a space, in which mark "**Here insert Figure —,**" and also mark the title of the illustration. If cuts have not been made, send the original drawings, photographs, etc., with the manuscript but **not attached to the sheets**, and marked to correspond with the places where they are to go in the copy. It is advisable whenever possible, for the author to have the originals of these illustrations fully prepared for the engraver. To do this properly requires some knowledge of drawing and of the preparation of photographs, etc., for the photo-engraver. which subject has, therefore, been treated at some length on page 228. In sending original drawings and photographs to the publisher, care should be taken to keep them flat, as otherwise they may be broken or torn in transit so that reproduction is made difficult

or impossible. It must be remembered that, as a rule, the book cannot be made up into pages until the cuts for illustrations have been supplied, so there should be no unnecessary delay in the preparation of the illustrations. If, however, it should happen that one or two cuts are still missing when the book is made up, the work need not be delayed, as if the exact sizes of the spaces that the illustrations are to occupy are given to the printer, he will make up the page, leaving this space blank until the cut is supplied. This method should not be resorted to except where absolutely necessary, and should not be adopted in any case, with a large number of illustrations.

It may be well for a contributor sending in an article descriptive of some building, machinery, etc., to keep in mind the usefulness of familiar objects as a scale of measurement. Wherever in a photograph a man, boy, dog, tool, etc., is included, a scale of size may be based on this object, where in the absence of any such familiar object, it is often difficult to estimate sizes.

11. **Abbreviations.** As a general rule, words should be written in full or abbreviated, just as they are to be printed, but much time may be saved in writing a manuscript by the use of abbreviations for common words, which, when enclosed in a circle, are understood by the printer to be set in full. Thus, "Main St.,"

enclosed in a circle would be set "Main Street;" "Engr.", encircled, would be set "Engineer." Conversely, "Main Street," enclosed in a circle, would be set "Main St."

12. Notes for Guidance of Printer. Should it be necessary to insert memoranda for the printer other than the marginal notes and corrections here outlined, they should be written in an ink of different color from the text matter. Should there be any considerable number of general instructions, it will save time and confusion if these are written on a single separate sheet to accompany the manuscript, and marked: "Notes for Printer," instead of repeating them throughout the manuscript.

THE LITERARY FEATURES OF A BOOK

The literary features of a book consist (and in approximate order) of Title, Copyright, Dedication (an optional feature entirely), Preface, Table of Contents, List of Illustrations (if sufficient to warrant listing), Introduction (optional, and usually considered as part of the Text, especially where the Preface is at all lengthy), Text (with or without illustrations), Appendix (an optional feature, usually consisting of material closely but indirectly related to the subject-matter of the book), and Index. Another item sometimes found, but always objectionable, is the "Errata," consisting of errors discovered after the sheets have been

printed. An "Errata" sheet, when necessary, is inserted at the beginning of the book, just before the text matter, and is usually a sheet of same size as the book-page. It too often indicates careless proof-reading and is to be avoided, whenever possible. An "Addenda" sheet is sometimes used to include some new matter brought to the author's attention after the printing of the sheets; it helps to bring the book up to date, and when it does so, is commendable.

Of the literary features mentioned, the Title, Preface, Text, and Index are the only ones that should need any special discussion. Copyright is treated on page 178. The Table of Contents is merely a list of the chapter-heads, sub-heads, etc., with page folios, arranged for the reader's easy reference, and if the subject matter has been properly divided and sub-divided, the compilation of the contents presents no difficulty. The List of Illustrations is merely a list in the order in which the illustrations appear.

1. **The Title.** A Title should be brief. Years ago long titles were the custom, of which Bunyan's "Pilgrim's Progress" is a good example, having thirty-eight words in the full title. Today, however, in all branches of literature the short title is in favor. It is more easily remembered and referred to. No more words should be employed than are necessary

to indicate the subject matter and the method in which it is to be treated. If it is found difficult to observe this limitation of brevity, a keyword title should be selected, and the necessary amplification expressed in a sub-title. Such a title as "The Principles of the Economic Design of Electric Power Transmission Plants" is clearly undesirable from more than one standpoint. "Electric Power Plant Design" is much preferable. "Principles," "Economic," and "Transmission" add nothing to the inscription. It is naturally to be expected that "principles" will be set forth in a work of this nature; that "economical" methods will be described and advocated, and that there will be "transmission" of the power generated, for practical uses. The make-up of the title-page should have careful consideration.

2. **The Preface.** The Preface is that portion of the book in which the author usually explains his purpose in writing it; where he outlines his method of treatment of the subject, and gives credit for his material to whom credit is due. Many reviews of technical books consist merely of a re-hash of the words or ideas of the Preface, and some authors, especially those of the "hack" style, take advantage of this by making rather broad statements of what their books are or are supposed to be, and by indulging in considerable self-praise; in order to obtain good notices, with their con-

sequent sales. The Preface should not, however, be considered as an opportunity for this indulgence; the author should remember that he is addressing the public that is to be convinced of the worth of his publication. In this series of introductory remarks he should, therefore, state in small compass the method of treatment accorded the subject matter of the work, setting forth any original features and the strong points it possesses which would warrant its purchase by the class of readers likely to be interested. The fact that book notices—almost entirely—and book reviews—to a considerable extent—are based upon such preliminary recitals, should be borne in mind, also the needs of the individual in the publisher's sales department whose highly necessary duty it is to give effective publicity to the work, but, as stated, these facts should not be assumed by the author as an opportunity for self-glorification.

In the Preface an author often acknowledges the assistance of some friend "in reading the proofs"—mere drudgery. Why not have your friend read the manuscript and thus, if he has had any good suggestions to make, have the changes made before the manuscript is in type and save both time and money. In former days, it was customary to have a Preface written by some man of prominence as an introduction to the subject, and in many cases

the Preface was of far more literary merit than the body of the text, but now, such introductory remarks are used as an "Introduction," and the Preface is reserved for the author's purposes. The Preface ought to be dated, as it becomes after a series of editions, each containing a supplementary preface, an important feature in the history of the book, or of the subject treated.

3. **The Text.** In general arrangement it is a good plan to follow precedents set by experienced writers and established publishing houses. There is scarcely a technical subject that can be written about that has not already received treatment at the hands of one or more authors, and while rigid adherence to prescribed forms is not advised or always advisable, much valuable information concerning technic can be gained through an examination of the contents of books of a similar nature. This is especially so in regard to the division of the matter into Parts, Chapters, Articles, Paragraphs, etc., all of which should be clearly shown in the manuscript.

In preparing tables the limitations of the size of the printed page and the type used should be considered. Inserts, or folded plates, should not be used if at all possible to do without them. The two page-sizes most favored are the "Octavo" (8vo.) and the "Duodecimo" (12mo.) having respective type dimensions

sions (excluding page headlines) of about 4 x 6¼ inches and 3⅝x5¾ inches, and trimmed page sizes of 6x9 inches and 5x7 inches. With usual size of type and spacing employed, an 8vo. page contains about 360 words and the 12mo. page about 280. It is easy, therefore, to approximately calculate* the number of pages that the text will occupy, and to this number should be added an estimate for illustration, and some 15 to 20 pages more for title, preface, contents, index, etc.

As to style of composition, sufficient has already been said to show that a clear, concise, and exact form of expression should be adopted. Let the sentences be short and the statements free from ambiguities. There can be no fixed rule for the length of paragraphs and sentences. Sometimes a paragraph may consist of a single sentence; sometimes of an entire page or more. Likewise a sentence may consist of two words or one hundred words. It must have a subject and predicate, and its complexity and length consist in the modifications and qualifications attached to these. Study of the paragraphs and sentences of good writers will aid materially in a suitable division of the text, but as a rule, and especially for young writers, a good rule is to avoid long sentences.†

* For a more exact system of estimation of space occupied, see page 270.

† Frederick Harrison said "It is a good rule for a young writer to avoid more than twenty or thirty words without a full stop, and not to put more than two commas in each sentence, so that its clauses shall not exceed three."

Among standard writers, Bacon averaged 22 words to a sentence, and Milton 60.80; between these there are many variations. Variety in sentence forms is needed. The use of many short simple sentences and of straggling compound sentences where the statements are tied together loosely by "and's," "but's," "or's," "which's," "however's," "therefore's," etc., shows that the writer does not possess the necessary variety of forms in which to cast his thought.

It should always be kept in mind that writers of technical books are supposed to have something to say that is of value to busy technical men, and it is well to say it in a clear and concise form. The "best style" is a presentation of the subject in good, clear-cut English, by one who thoroughly understands himself, but who does not assume that all of his possible readers are equally well-informed. Naturally the treatment will depend somewhat on whether the author proposes to issue a book that will be useful to the beginner as well as to the more trained engineer or intends to appeal only to a small class of experts (see page 345). The single purpose of the book should be kept in mind at all times, and collateral discussions, however inviting, should be limited to the strict necessities of the work.

After the completion of the manuscript, it should be laid away for a few days, and then

reread; for it will often be found that statements made can be more happily phrased, and that certain words can be replaced by others more precisely expressing the ideas intended. Nearly everybody will realize that in both written and oral discussion of a subject, there is a tendency on the part of the author to expand his remarks in order to make himself thoroughly understood, but that when these remarks are read over with the continuity presented in the completed manuscript, their content and spirit will be fully preserved while their wording may be greatly condensed and altered. .

4. **The Index.** The preparation of a serviceable Index is a test of the author's good common sense. The Index is a very important part of the book, but unfortunately it is often very unsatisfactory and sometimes almost useless. The secret of good indexing is the intelligent selection of keywords for each topic, words that are likely to suggest themselves to the seeker after information under the several topics, and that with this word selected, every reference under that head should be included. The writer should, as far as possible, endeavor to put himself in the position of the class of readers who are but just sufficiently qualified to take up his work and to derive benefit from it. He should devote careful study to each of the final page-proofs, and make all the entries in the Index to which he can conceive it possi-

ble that such readers will recur. This embraces suitable cross-indexing, the inclusion of cross-references and the sub-indexing of topics under others to which they may reasonably be considered to be related. And, while it is desirable to extend the limits of an index no more than is necessary, any doubt as to the propriety of a particular entry should be settled by its retention. The subject of indexing is more fully taken up on page 324.

Much more could profitably be written under each of the foregoing heads, but enough has been said to indicate to authors the advantages accruing to them from the proper preparation of copy; to show that thought and care expended in advance of the presentation of a projected book to a publisher, will be beneficial to themselves and to the publisher, and will likewise result in advantages to the buyer and the reader.

SPECIFICATIONS FOR TEXT-BOOKS

Many additional suggestions regarding the arrangement of the literary features of the book may be obtained from a study of the specifications presented by Prof. I. O. Baker, in a paper read before the Society for the Promotion of Engineering Education, in 1895. Prof. Baker spoke of the difficulty in giving young men a general and also a professional education in only four years, and said that

the difficulties could be decreased by improving the quality of the text-books, along the lines of the following specifications, which, he claimed, would apply in most particulars also to engineers' reports, contributions to the proceedings of engineering societies and to engineering periodicals.

His specifications, in condensed form, are :

1. The matter should be arranged in proper sequence.
2. The language should be clear, concise, and forceful.
3. The running titles and headlines should be so arranged that the reader can easily and quickly find any particular part.
4. Diagrams and figures, as far as possible, should be inserted at the most convenient place in the text, and be accompanied by a descriptive legend.
5. Folding plates should be placed at the end of the volume.
6. Folding plates should have a blank stub, such that when the plate is unfolded the printed matter will be entirely outside the body of the volume.
7. The several divisions should be indicated by the proper headings, and the minor subdivisions (sections) should be numbered continuously through the volume, chiefly for convenience of cross-reference.
8. Cross-references should state also the page.

9. Attention should be given to the typographical arrangement of mathematical formulas.

10. The nomenclature should be suggestive of the quantity represented.

11. The nomenclature should be prominently stated before being used.

12. Each table should have a serial number, and a fully explanatory title at its head.

13. Tables should be divided horizontally by frequent lines.

14. Each horizontal line of a table should have a serial number.

15. The vertical major divisions of tables should be indicated by double rules.

16. The relative divisions of the several columns of the table should have consideration.

17. Matter of minor importance should be printed in finer type.

18. The book should have a very full index, with page references.

19. The collections of "useful tables" frequently printed at the close of the volume should be preceded by a list of titles.

20. The mechanical execution should be in keeping.

XI

“FIELD” AND “POLICY” OF TECHNICAL JOURNALS

The primary purposes of any journal should be the production of revenue, and the securing of a position of paramount influence in the field it represents. The attainment of this twofold aim depends upon the combined efforts of the business and the editorial departments. On the latter depends the standing of the journal as a power in its field; to this department the periodical looks for the supply and selection of literary material of a character useful to a certain class of readers. Here the business department steps in and through the circulation of the periodical among these readers, obtains advertising, on which the journal must depend for its main revenue, in fact, for its very existence. We are not interested in the present work with the details of management of either the business or the editorial department, but it will be seen that the success of a periodical as an authority in any branch of literature and as an advertising medium is based on its literary pages, and this, in turn, shows the necessity of care and a definite policy in the selection of the material for publication.

This editorial policy covers all features of the literary pages: the character of articles acceptable; the standards of quality; the acceptance, rejection, editing, and return of contributions; payments for contributions; abstracts and reprints from lectures, papers, reports, etc., presented at conventions and society meetings; the illustrating of articles; the use of letters addressed to the editor; reviews and notices of books; standardization of type and make-up of text pages, and many similar details.

There are, perhaps, journals made up of a hotch-potch of clippings, without any literary excuse for existence, but every high-class and successful journal has a definite "Field" and "Policy," to which it rigidly adheres. The field is necessarily a development, depending upon the progress of the department of the profession to which the journal relates and upon varying commercial conditions. It is almost as impossible for a journal to decide on the limits of its field at the commencement of its existence as it is for a college student to decide on the limits of his future work on his graduation day. In time, however, the journal "finds its level," and when that time arrives and a definite field and policy have been adopted and declared, the journal should show evidence of a consistent adherence to these principles.

Acceptance and Rejection of Articles. No

journal can, of course, within the limits of its space, publish everything of interest relating to its specialty, but it should be the purpose of the editors to keep in touch with the whole range of information in that branch of the profession and select for publication the best material that they can find relating to it.

Writers frequently ask a periodical if an article on this or that subject is "in its line." As a rule, all articles connected with the declared field of the journal are directly "in its line," but whether they will be acceptable or not depends solely on the editor's judgment as to their interest and value to the readers. Editors are always pleased to receive contributions on any subject "in its line," from any source whatever. These are usually examined by the managing editor, and such as are found unavailable for use in any form are returned to the senders when such return is requested. Contributors should always specially request return of manuscript when this is desired, and especially of drawings and photographs. It is also well to send stamps with a contribution to cover cost of such return. (See page 212.)

Editors will, as a rule, give an opinion as to whether an article on a given subject is likely to prove interesting, but the final acceptance of an article is seldom, if ever, made until the complete manuscript, with illustrations, has been submitted.

It is seldom that the receipt of material for publication is acknowledged, unless specially requested. Losses in the mails are so rare that it is not deemed worth while to incur the additional labor of such acknowledgment, hence it is advisable to send a contribution by registered mail, with request for receipt, or by express.

In the case of contributions found unavailable and returned to the sender, it is not customary for editors to state by personal letter the reasons which influence their decisions. The paper may be lacking in interest, or imperfect in preparation, and it is not within the province of an editor to criticize the contributor's work. He either accepts it or does not accept it. In the latter case a printed slip or letter usually accompanies the manuscript to the effect that the return of the article does not necessarily imply that it is lacking in merit or interest, but that the amount of matter offered for publication is so large, that a rigid selection has to be made and many articles have to be returned.

Some years ago this printed note brought an indignant reply from a "Scientist" who had offered a manuscript in which he claimed to have upset an established engineering formula that had been in universal use for half a century. A portion of this letter read as follows:

"The return of my paper by means of a

printed blank, looked to me so mean and insulting, that I concluded to avoid being reminded of the insult, by henceforth considering "_____ " as non-existent. * * * It is hard for an old scientist to have his work judged of in private by newlings, but harder yet to have it done by printed blanks. The rudeness of it must make enemies unless my nature is all different from that of others."

Naturally, any journal would regret to be considered as "non-existent," but for the reasons above stated, the printed forms are still used by all high-class journals and they all thereby run the risk of making enemies of contributors like the "old scientist" just quoted.

Trade "Write-ups." What has been said with reference to the offer and return of manuscripts applies especially to papers that are submitted for publication and for which their writers expect compensation, but the general principles of consideration apply also to all classes of contributions. Editors are frequently asked, for example, what their position is in reference to what are commonly known as "trade write-ups." This is a matter regarded from widely varying points of view by different periodicals. The higher class journals seeking to give real information to their readers apply the same general rule regarding selection to this as to other

material—that the first consideration is the interest of the reader. The fact is generally recognized that outside of “Civil Engineering” in professional work, the great bulk of the constructive engineering work that is carried on in this country is done by manufacturing firms. It is to them therefore that editors have to look, chiefly, for a great deal of matter of interest and practical value to engineers, and contributions from such firms are always welcomed, but they must be judged on the same basis as those from any other source. If a manufacturer has a new machine or device of interest to engineers, and will furnish a periodical such drawings or particulars concerning it as will enable an engineer to form a judgment as to its merits, the editors can often prepare an article that will be of great practical value to many of their readers. On the other hand, if the manufacturer sends in a cut of a machine which shows nothing except what a wood-engraver imagines its external appearance to be, and a so-called description which, in reality, is only a string of vague generalities concerning what he considers its merits, he has no cause for complaint at the editors’ decision that such matter is not of sufficient interest to their readers to warrant their giving it space.

This sort of descriptive article is commonly known as a “write-up.” It is as a thorn in the editor’s side. It is produced for commercial

purposes only, with nothing of professional interest about it, and it does not deserve to rank as technical literature. There are papers that consist almost entirely of such material—mere bundles of circulars that have filled the requirements of the law and have obtained the second-class mail rating. But the “write-up periodical” is not recognized in the ranks of high-class journalism. The “write-up” is a scheme to get something for nothing; to get a little more publicity than an advertiser pays for, or to get publicity without paying for it at all, and further to get this publicity under the stamp of a journal’s editorial commendation of the article described. The advertiser pays his money for the privilege of addressing the audience reached by the periodical, and is not entitled to be specially boosted in the pages for which the subscriber pays his money with the expectation of receiving reliable engineering information.*

Correspondence. A department of many journals which is often much appreciated by its readers is devoted to “Correspondence” or “Letters to the Editor.” The object of this department is to provide a place for the open discussion of matters of interest to readers. It should be conducted with entire impartiality and contributors should have perfect freedom

*This matter is so important and so generally abused in technical literature, that I have quoted an editorial on the subject on page 158.

in the expression of their opinions concerning such current questions as may interest them, whatever their views or opinions may be, provided, of course, that their letters come under the rule above stated, namely, that they are matters of general interest to the readers of the journal.

In cases where readers criticize the work of some person or firm, and the letter is judged by the editor to be worthy of publication, it is a usual practice to submit an advance proof of the letter to the party who is criticized and afford him an opportunity to reply in the same issue in which the criticism appears. In all such discussions, it is naturally expected that those taking part will observe the usual courtesies of debate and refrain from libellous or insinuating personalities. If that point is reached, or when the debate has reached a point where it lacks general interest, the editor will summarily close it by refusing to publish further correspondence.

Contributors are always at liberty to veil their identity under *noms-de-plume* if they choose in the publication of matter; but in writing to an editor they should always give their real names; otherwise the waste-basket is the inevitable end of their contributions. One would suppose that the standing rule of all reputable publications that "No attention can be paid to anonymous communications" would

at this day be well known to all intelligent men. Yet editors regularly receive letters signed by fictitious names. If the writers of such letters would imagine themselves in the place of the publishers they would readily perceive the necessity of this cast-iron rule and the reasons why such letters or the information they contain cannot be published. Also letters are frequently received by editors containing items of news for publication when it seems evident that the writer omitted to sign his name merely from modesty—or carelessness. He did not reflect that without an authoritative signature the news lacks all authority. Such items would not be published by any newspaper, so surely not by a publication which aims at accuracy and reliability, as does the average technical journal.

There is much misapprehension in the minds of readers as to the degree to which editors assume responsibility for the matter published in the various departments of a journal. To make this clear, it may be said that the matter published in the editorial pages, and in fact, all matter not signed or otherwise credited to some source, may be understood to be prepared by the editors; the contributed matter and the matter taken from proceedings of engineering societies represent the views and opinions of those to whom it is credited, and not necessarily the opinions of the editors. It may be

assumed that all such material has been examined by the editors, and has been judged by them to be of sufficient interest to be worth publication; but it does not follow that they approve of or agree with the ideas or opinions which the writer may express. In the "Correspondence Department," especially, it should be the aim to give a fair field to all who have something to say that is worth saying, whether it coincides with the journal's opinions or not. The responsibility that could be assumed by the editors in this department is limited to that of seeing that every correspondent practices the ordinary courtesies of controversial discussion; that personalities are eliminated or modified, and that the time of the paper's readers is not consumed to the exclusion of more valuable matter by trivial subjects or long-drawn-out disputes. To "edit" these letters beyond this point, and particularly to select and trim them to suit the opinions of the editors, would result only in dispossessing them of any value they may have as individual expressions of opinions. Neither would it be fair for editors to support either side in a controversy.

This defining of the extent to which an editor's responsibility extends should not be misunderstood as magnifying the importance of an editor's own opinions. Editors are generally well aware that they are far from infallible; in fact, they are probably better aware how

far their work falls short of whatever high standard they may have set for themselves, than are any of their readers. But an editor of a reputable periodical is, as a rule, at least conscientious in adhering to the principles that have been outlined of impartiality and consistency to the interests of his readers and of the profession represented by his journal.

Personals. There is no department, perhaps, in which a journal is more dependent upon its readers for assistance, than that of "Personals." This is usually a very brief summary of items of personal interest concerning people connected with the profession, and to get these items a journal must rely on its readers to furnish the necessary information. What should be especially desired as matters of interest to the profession or trade and what readers should send in are notices of appointments and changes in official positions, but under ordinary circumstances, few periodicals can afford the space for noting reelections and reappointments. As this department is one of information only and is not conducted to advertise the business of any individual, such items should be excluded as are mere records of ordinary professional engagements of consulting engineers.

As a typical example of a formulated policy regarding the selection of matter for publication, and of policy regarding style (typograph-

ical, etc.) adopted in the make-up of the text matter, there follows below, a reprint of an editorial in "Engineering News" covering the selection of matter for publication in that periodical, and on page 289, rules for the make-up of the text matter.

SELECTION OF MATTER FOR PUBLICATION

(Reprinted from an editorial in "Engineering News," April 24, 1902.)

The frequency of requests from manufacturers, advertisers and others for the publication in this journal of articles descriptive of tools, machinery, apparatus, etc., has caused the preparation of the following explanation of our policy with reference to such articles:

I.

The selection of all matter for publication in the reading matter pages of Engineering News is made solely on the basis of its interest and value to the readers. This journal has no "deadhead" list. Its subscribers pay five dollars a year for their paper and are entitled to receive the best matter that the editors can select. To make this selection on any other ground than the readers' interest—to publish this article to please a personal friend, that to please an advertising patron, the other for some form of payment, direct or indirect—is essentially to defraud the subscriber.

The article which is chosen for such ulterior reasons might be in itself comparatively harmless; it might be so well written that not one reader in a thousand would notice it to be below the standard usually maintained in this journal; yet if the principle is once established that articles may be selected for publication for other reasons than their actual value to the reader, the road downhill is an easy one. If one advertiser is given a "trade-write-up," another must have a "reading notice." It is a short step from that to the direct sale of space in the reading matter pages as part of an advertising contract, and another short step to the publication of paid puffs to help one competitor and paid blackmailing articles to injure another.

This is the reason why our rule that the readers' interest, and that alone, must govern in the selection of articles, is rigidly maintained.

II.

A very large part of the important and interesting engineering work of the present day is being done in connection with manufacturing establishments. The published description of this work may be and often is an exceedingly valuable advertisement for the parties interested. This fact, as stated above, is no reason why we should give space to it in

Engineering News; but on the other hand, it is no reason why we should exclude it. What we are after is what will interest our readers. If the publication of an article benefits somebody or other as an advertisement, so much the better.

The editors of Engineering News, therefore, receive and examine with great care matter submitted by manufacturers, advertisers, and others descriptive of new devices, machinery, tools, plant and methods of doing work, and selection is made from this matter solely on the basis of what the editors believe to be the interest of the readers. Thus the "trade-write-up" is judged on the same basis as the original contribution of a practicing engineer, or the paper read before an engineering society. The better the article which the manufacturer submits, the better its chances of acceptance. It must be remembered that the amount of matter offered to the editors, and from which they must make their choice, is many times as great as the pages of Engineering News can contain. Obviously a great deal of matter has to be rejected, not because it is not good, but because it does not rank among the best.

III.

The conditions of publication are often of importance in determining the acceptance or

rejection of an article. The "trade-write-up" which is sent out broadcast to all sorts of trade journals is pretty sure of rejection. That which is sent out for simultaneous publication in a limited list of papers stands a little better chance, but if accepted it will generally be given briefer space than it would receive were we given the first opportunity of publication, or were the article given to us exclusively.

IV.

Not only for the sake of securing its acceptance, but for the sake of holding the interest of the largest number of our readers, it is worth while to take much pains in the preparation of matter to be offered to Engineering News. Where matter is to be submitted by a manufacturing establishment we would counsel its preparation by the engineering department rather than the advertising department. What we want, and what our readers want, is not "glittering generalities" but plain statements by the practical men of how engineering problems have been solved. For illustrations, we prefer drawings or blue-prints and good photographs, from which we can prepare our own cuts.

V.

Final decision as to whether an article offered to us will be accepted, cannot be made until the completed article is placed in our

hands. We will give an opinion, however, on request, as to the probabilities of an article on a stated subject being acceptable. Matter found unavailable for use will be returned, if return is requested.

VI.

As a rule, new inventions, machines, etc., are not described until they have been actually built and practically operated. Exception to this rule is made only in case a device is of unusual interest and is of such a character that its merits can be fairly judged from the description and drawing. It may be added that this rule works to the benefit of the inventor. It is a mistake to rush into print with the description of a device until it has actually taken concrete form, and until actual experience can be quoted in support of the claims made for it.

VII.

We pay cash for original contributions to Engineering News. Articles prepared by our own staff on the basis of information furnished by manufacturers are of course not paid for, under ordinary circumstances. No articles are paid for unless furnished exclusively to us, and in the submission of matter by manufacturers it should be explicitly stated whether any prior publication has been made, and, if so, where. (Mention in trade catalogues should

not be omitted.) It should also be stated whether exclusive publication is offered to us or whether the matter is to be given to other journals, with full particulars.

VIII.

The editors lay no claim to infallibility of judgment or infinite knowledge. They may often err in their selection of matter by accepting the poorer and rejecting the better. Moreover, they have to be governed by conditions of which the outsider knows nothing. Available space and current interest in a particular line may often cause the acceptance of an article which is in other respects not so good as other articles which meet with refusal. The demands on the time of the editors are such that they cannot undertake to state in detail the reasons which govern their decision to accept or reject any article.

IIX

THE "WRITE-UP" ARTICLE

(Reprinted from an editorial in "Mining and Scientific Press," of Dec. 26, 1908.)

The exploitation of a manufactured product in the guise of reading matter is called a "write-up." It is not a literary word and it does not represent literature; it is the exponent of a commercial idea in the guise of scientific or technical information.

In the daily press you find yourself reading a paragraph that begins with a seductive reference to the "grandeur that was Greece or the glory that was Rome" and ends by recommending Snook's soap. In the financial press you become absorbed in a picturesque account of South African mining only to discover that you have been inveigled into a consideration of the opportunity for sudden wealth presented by the shares of the Great Bullion Extended Mining Co. in southern Nevada. In a technical paper you plunge into a turbid description of pumps and their work in mines, to find that the purpose of the article is to recommend the Jones centrifugal pump manufactured by the Jones Co., of Jonesville, Tenn.

If you are good natured, not too busy, and possessed of a sense of humor, you laugh at

yourself as the victim of a practical joke; if, however, your liver is sluggish, or you are a busy man, or do not appreciate foolery, you kick yourself for being deceived and there is developed a longing to express your sentiments to the responsible editor. Undoubtedly, the "write-up" is in the nature of an impertinence.

But beside the cruder forms of this insidious method of gaining publicity without payment, there are unaffected descriptions of manufactured products that appear in trade and technical papers. Thus the write-up becomes a specious indorsement of one advertiser's wares at the expense of the other advertisers, and eventually it is to the detriment even of the favored individual. For it is obvious that if a "write-up" is not as trustworthy as matter coming from an unprejudiced source, then it lessens the interest of the reading portion of the paper and renders the advertising less valuable. There is no escape from this conclusion.

The representative of a machinery firm brings a description of his works, with a photograph of the establishment, and wants it published as reading matter. The sight of it in the paper may gratify the members of that particular firm, but it is certain that it is of value to no one else, for the products of manufacture do not depend for their excellence on the appearance of the building in which they are made. Moreover, the insertion of such an

article is not fair, for the advertiser is simply asking for so much gratuitous advertising in a part of the paper where he thinks he may get exceptional publicity. The reader is annoyed, for the "write-up" is not of interest to him; he does not rate Smith's pumps by the look of Smith's factory.

It comes to this, that anything which lessens the interest of the reading pages tends to hinder the purpose of the advertising; protect the reader and you safeguard the advertiser, for no one that has become annoyed or displeased with the reading matter is likely to spend much time over the advertisements; on the contrary, it is the satisfactory character of the articles that will cause a reader to hold a paper in his hands long enough to turn over the pages of advertisements.

But we shall be told that there are write-ups and write-ups; that what we have said may apply to certain forms of this method, but it does an injustice to the skillful write-up, which gives reliable information while incidentally fulfilling another purpose. This is a matter of opinion. Even the best of the stuff sent broadcast by the publicity bureaus of manufacturing companies is prejudiced; among the facts lurk fallacies; between the scientific data are sandwiched the exaggerations of a salesman. It may be a long way from the fervid rot of a corn doctor to the pseudo-scientific literature

of a publicity manager, but there is every gradation between them and they are tainted by the same fatal defect.

It is the editor's duty to protect his reader; in so doing he advances the best interests of the advertiser, for by such methods the advertiser is given the best opportunity to win the attention of the reader. For this reason the signed article that masquerades as an independent statement, while really the puff of an advertiser, is particularly objectionable.

Not content with self-laudatory paragraphs, some manufacturing firms employ technical men to write articles for publication, in which the principles underlying certain types of machinery are specially advocated, so as to prepare the way for the reception of a recommendation of the machines themselves. Of course, there is no reason why the inventor or the manufacturer of a machine should not tell the truth in an interesting way, and it happens often that information concerning processes and devices can be obtained only from such sources. In that case, the position of the author should be frankly stated; it certainly would be deemed a courtesy to the reader and would tend to inspire confidence. Any feature of the reading pages that wins the confidence or commands the respect of the reader, by so much increases the value of the service given to the advertiser.

Is this Utopian and impracticable? We trust not. It is sound business, not poetry. The practice of recommending mining stocks and puffing companies in the editorial columns because they advertise their prospectuses on another page has died out in America, that is, among the journals of any standing. In London the mining papers are still subventioned in various ways; the mining company pays for an account of its meeting, for the publication of reports, for reprints of the speech made by its chairman, and for sundry other ways in which it gets favorable publicity; the papers distribute praise or blame, or maintain an ominous silence, according to the amount of advertising taken with them. Paid matter appears in the heart of the reading pages, the right hand watches the left, the business department and the editorial are partners in a sordid business. And what is the result? The advertising pages have scarcely any value. Why? Because the reading matter is unreliable. There you have it.

In America the leading journals do not insert paid matter in their reading pages, and the only blemish is the "write-up," which is a sop to Verberus, the donation of extra publicity gratuitously to those who advertise, or are expected to advertise, in the paper. This reminds us of a petty form of "graft" operated in connection with write-ups. A firm that does

not advertise with you will send a write-up "because it is interesting" and it will have the cheek to ask you to publish it to the end that its products may be advertised free. This does an injustice to the advertiser that pays. The excuse to be made for the "write-up" is that it is a courtesy to a client, a concession to one with whom you are doing mutually profitable and honorable business, therefore when a non-advertiser asks for advertising space in your reading pages he exhibits monumental effrontery. Your reader does not even have the satisfaction of turning to the advertising pages for further information. A young man obtained a testimonial as to his ability from his own mother. That is the "write-up" in its simplest form—interesting to the family!

XIII

RIGHTS OF AN AUTHOR IN HIS WORKS

Literary Property. The general term used to express the ownership which an author has in his works, without reference to the point whether he claims it under the protection of a copyright or not, is "Literary Property," which accordingly, includes the ownership of unpublished or manuscript works, letters, etc. It is generally recognized that if a person composes a literary work, and does not choose to publish it, it is still as much his property as is his real estate. He may not have legal rights simply in his ideas, but he does have a title to them considered in reference to the outward form in which they are clothed. This feature of common law protects an author from improper use of an original manuscript sent to a publisher or printer. In case of any improper use of his property the regular legal remedies for the violation of rights of property would be applicable, and the usual incidents of property would attach; still, for special reasons, such unpublished writings cannot be taken by creditors in payment for debts. An owner of this kind of property can sell it or dispose of it by

will, or it may pass to his representatives at his death in the ordinary course of succession.

The rights of an author in a letter addressed by him to a correspondent have been frequently considered by courts of justice, with the general decision that, while the author parts with the paper on which the letter is written, he still retains an ownership in its sentiments and expressions. By this divided ownership the receiver is entitled to the letter considered only as an autograph, while if he publishes the contents, he may be pursued by an action in court. The ownership of the receiver is corporeal, that of the author is incorporeal. In the same way if an author should address in writing a poem or other literary work to a friend, a distinction between the ownership of the paper and the poem would immediately spring up. This rule does not apply only to letters having a literary character, as such distinction could not be made and maintained, so that in general a letter or other literary production cannot be published by its receiver or any other person without the consent of the author, unless it may be to vindicate the receiver's character or to subserve the ends of public justice.

On the other hand, it is clear that an author of a manuscript may absolutely lose all proprietary rights of it by printing it and placing copies on sale without obtaining copyright.

It is then considered as dedicated to the public and becomes equally the property of any one who wishes to use it, and cannot be copyrighted in its original form by either the author or any one else.

Literary property may, in this state of ownership, be assigned, as is often done by a publisher's purchase of a manuscript from an author. This gives rise to a distinction between an author and a mere proprietor, a distinction constantly referred to in the copyright law. The sale of a manuscript will, unless specific stipulations are made to the contrary, give the purchaser all rights which the author of it, considered as an unpublished work, would possess. Whether the purchaser could take out a copyright or not would depend on special conditions based upon the provisions of the copyright statutes.

Copyright. By the term "Copyright" is meant an exclusive right given by statutory law to an author or proprietor to multiply copies of his work and place them on sale. Without this statutory protection the act of publication would be regarded by the courts as an act of dedication of the work to the public, and accordingly destructive of the author's right of property. The policy of the copyright law is to give the author or proprietor protection in the sale of his work for a specified period, and then to

throw its publication open to all. This theory is marked out in the United States Constitution, which gives power to Congress to secure to authors the exclusive right to their works for "limited times." The whole subject is under the control of Congress, and any legislation of a State affecting copyright would be inoperative and void. The result is that if an author does not choose to publish, his right to his manuscript is perpetual, and may be vindicated in courts of law on general principles of justice; if he prefers to publish, he brings himself within the purview of the law of Congress, must have his right only for such time as the statute provides, and must seek his remedies exclusively in the United States courts.

A digest of the new copyright law is given on page 178, but it may be said here that in general anything may be copyrighted that is the subject of literary ownership. More specifically, the term "Copyright" is used applied to books, maps, charts, dramatic or musical compositions, engravings, cuts, prints, photographs and their negatives, paintings, drawings, chromos, statues, statuary, and models, or designs intended to be perfected as works of fine art, and in determining whether one of the subjects can in any particular case be copyrighted, it is necessary to consider how far it is original with the professed author. There are some compositions of such a profound or intellectual

character that the question of originality cannot successfully be raised. On the other hand, there are works of a much humbler sort, but still of a highly meritorious and useful nature, compiled from material already existing in literature, and open for public investigation and use, and in which the only original feature is in the selection, arrangement, or combination of this material. Instances of this kind are found in every department of engineering work as well as in such works as grammars, arithmetics, geographies, maps, charts, etc. These, as far as they are the work of the compiler or author, are the subjects of copyright, but he has no exclusive right to the materials which he did not originate. Any other person may resort to them and prepare a work from them, but he must not make use of the copyrighted book as a mode for collecting his materials. His correct course is a resort to the original sources of information. An illustration of these principles may be drawn from the collapse of the Quebec Bridge and its subsequent investigation. A writer could have no copyright in the opinions and findings of the commission, as of these he is not the author, but he could lay claim to a statement of the facts of the case, as well as to an abstract of the opinions prepared by himself. The translator of a foreign work not the subject of a copyright here may have a copyright, as he is for practical

purposes an "author"; still, any other person may translate the same work and have himself a copyright. It follows, therefore, that there can be no copyright in a subject, but only in the means of treating it. For example, one cannot obtain in this way the exclusive right to make maps of a particular town or section of country, though he might acquire one as the result of his own labor and surveys, say, as a consulting engineer.

The word "book" as used in connection with copyright, has a wide meaning—it is not restricted to volumes, but may include a single sheet. An individual issue of a periodical is a "book." There can be no copyright in a mere title unconnected with a book, but where a title is used to designate a work, particularly a periodical, it may become of great value. Such a title constitutes part of the "good will" of trade and may be considered as a property right. Its registration and protection are provided for by the laws appertaining to "trade-marks."

As already stated, the property in a copyright is of an incorporeal nature. It cannot, for example, be seized by a sheriff and sold on an execution. Should the sheriff, for instance, sell, in this way, the plates of a copyrighted book, the purchaser would only acquire a title to the copper-plates, considered as material ob-

jects, with no right to print copies of the book from them.

Infringement of Copyright. The leading questions in the law of copyright concern infringement. The fact that a copyright is of an exclusive nature necessarily gives the author or proprietor a cause of action against one who infringes his right by placing copies on sale. Infringement is a very plain matter when the copyright work is simply reproduced. It becomes a complicated and difficult question when only extracts or quotations are made, or when resort is had to the book to make the public acquainted with its contents or to criticize its style or the substance of its thought. It has long been established that the identity of a literary work consists in its ideas and its language. The thought is so associated with the form in which it is expressed that a copyright does not protect an author against the use of his thoughts in a substantially different form, and it is for this reason that by general rules of law the unauthorized translation into another language is no infringement. Though the sentiment remains, the form is changed. On similar grounds, an abridgment, though made without the author's consent, is no infringement. This consists of a condensation of the author's language, and is substantially a different work. Where there is no such change, it is an abuse

of language to call the new work an "abridgment."

The question arises as to how far extracts or quotations may be made from a book without infringing. It is not generally regarded as an infringement to quote from a book for purposes of review, but when such quotations are made, the main question is whether they are calculated to show the character of the original work. The critic must not go so far as to substantially publish the copyrighted work. The question is really one of the value of the extracts made, which must be determined by the facts in each case. It is not satisfactory to consider merely whether there was an intent to infringe or steal. The real point is: has the author sustained substantial injury? The same general rule must be applied to other cases where extracts are made.

There is a marked distinction between a true abridgment and a compilation, considered as an exact reproduction of material. In the former, as has been said, there is a real and substantial condensation of the materials, which has been made with intellectual labor and judgment. In a compilation, however, there is assumed an act of taking the very words of an author, or with such slight changes as to show a close imitation. The law permits the condensation but does not permit the copying of the author's words to such an extent

as to do him substantial injury. Compilation is to some extent permitted in works when the main design and execution, or presentation of the subject is novel, and especially in dictionaries, gazetteers, cyclopedias, guidebooks, etc. In works of this class the materials must to a certain extent be the same. Novelty and improvement in them consist principally in abridgment, changes in arrangement, more modern information, correction of errors, etc. It is scarcely necessary to add that an infringement takes place by publishing but a small portion of the work, if that be a vital part and causes a substantial injury to the proprietor.

The remedies for the violation of a copyright are to be sought in the federal courts, and an appeal may be taken to the Supreme Court without reference to the amount in controversy. The regular remedies are an action for damages or an injunction preventing the continuance of the infringement, and as incidental to this the courts may direct an account to be taken of the profits realized by the infringer. Severe penalties and forfeitures are also imposed by statute law upon persons who wilfully and knowingly violate the provisions of the copyright acts. (See page 190.)

**GIVING CREDIT FOR DRAFTS ON THE LITERARY
WORK OF OTHERS**

What has been said above regarding the use of the literary work of others, refers to the rights of an author in his copyrighted work, but another phase of the subject is found in the use of uncopyrighted material, which may be said to be a matter of ethics.

In every technical article of value, if the author has studied the available information upon his subject, frequent use is made of material which has been previously published. The experienced writer, in such cases, always gives proper credit, either in a prefatory note or in the text, to the source of his information. There have appeared, however, at various times, books in which whole pages of text and numerous drawings have been either cribbed entirely or reproduced from apparent alterations. Frequent unfavorable comments have been made upon such practices, but as they have not appeared to be fully understood by some writers, "Engineering News" recently outlined in an editorial* what it considered to be the ethics of literary production, from which the following notes have been abstracted:

As a first principle in any literary work, technical or otherwise, the laws of honest dealing require an acknowledgment of borrowed matter. As has been said already, a man's literary productions are as much his property

* November 14, 1907.

as his real estate, and where these are protected by copyright their right is secured to the owner, as effectively as his house and lot is by a deed or title. When such legal protection is not invoked, as in the case of the greater part of periodical technical literature, it is because the authors or editors think that the matter may be of general interest, and for that reason, those so desiring it should not be put to the trouble of obtaining specific permission to reproduce it. The absence of such legal requirements does not change the ownership of the material or remove from the author the right to be credited for his labor.

There are many men whose only aim in literary production is to disseminate knowledge. Such men have no especial personal pride in their work, except for the work's sake, and are indifferent as to the proper recognition by others who copy their material, so long as the theory which they have evolved or the information they have collected is given to the world. In such cases the burden of responsibility rests upon the one who copies. Any unacknowledged statement in a book is assumed to be the work of the author, and, even if the originator is indifferent, the one who repeats it owes it to himself to disclaim the authorship and to give credit where credit is due. It is a poor sort of a man who parades another man's work as his own.

- But aside from the attitude of common honesty there is a phase of the matter equally as important if not so obvious, which holds in technical reproductions. That is the necessity of pinning every fact down to its original source so that the future investigator can have the benefit of original research, if he so desires. The technical periodical is an expression of the growth of the profession it represents. More than any technical book does it contain the working out of the daily problems of some branch of technology. It is the exchange place of new ideas. Necessarily from time to time certain men, better versed in a particular branch than their fellows, feel called upon to write a book upon that subject. This book will be a compilation of the results of the author's experience and study, which study must be largely from the experiences of other men, recorded in some printed form. No man can cover in his own experience the entire ramifications of any subject, however small it may be. Therefore he must draw on the periodical publication which is the principal medium through which past experience may be given out, and as the matter there published must be more detailed and discursive than can be compacted into the narrow confines of a general treatise, he can only draw in part or in abstract. However, the student may care to go further in his special investigations than
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the author could publish in his book. To bring his book, therefore, to its highest use, it is incumbent upon the author to record every authority and reference, to label the source of every piece of knowledge other than those of the most general nature. It is understood, of course, that the line must be drawn somewhere or else our books would be nothing but masses of references to past work. Where the information is the property of anyone who cares to investigate, such as is found in the news columns of our daily papers, or a matter of general knowledge in the present state of the art or even the simultaneous publication of several books or papers, it is unnecessary that its origin should be noted. When it is a matter of exclusive publication, or an idea of original discovery, the needs of the future student require that the source should be shown.

As an illustration of the extent to which this practice has gone, we call to mind a recently published English book in which nearly half of the material is taken from American periodicals, no credit being given in any instance, though the matter is frankly a compilation and the author is most punctilious in acknowledging his debt to the few European publications from which he has drawn. In one instance, particularly, he reproduces, with his own style of shading and lettering, certain

sketches made originally in the office of "Engineering News" by members of its staff; sketches which have no resemblance whatever to any other existing drawings. In view of the fact that a portion of his material is duly accredited to its proper place, the only deduction of the reader, ignorant of the true facts of the case, is that the remainder of the work must be original. In addition to the dishonest impression thereby given, how much more valuable would be the book if the reader who wishes to pursue the investigation could get hold of the matter as originally explained in full in the much more detailed accounts of the technical press.

XIV

COPYRIGHT

Copyright is a right of property in a work, of a literary, artistic or illustrative character, by which the author's, or other proprietor's, ownership in the work is protected by law. Copyright in the United States is granted by the Constitution of 1787, Art. 1, Sec. 8, which states that: "The Congress shall have power: To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The present Copyright Law was passed by both Houses of Congress on March 3; it was signed by President Taft on March 4, and went into effect on July 1, 1909. It is entitled "An Act to amend and consolidate the acts respecting copyright," and it takes the place of the copyright enactments formerly in force.*

* This digest of the new copyright law has been limited to those clauses of special interest to writers of technical books and periodical articles, who want to know, only in a general way, what may be copyrighted, how to secure a copyright, the cost, and the protection afforded. In case of a proposed assignment of copyright, or of a contemplated action for infringement, or where further detailed information is desired, the reader is advised to obtain the complete Copyright Law from the Copyright Office, Washington, D. C., which will be supplied free, on request.

NATURE AND EXTENT OF COPYRIGHT

The copyright law states that any person entitled thereto, upon complying with the provisions of this Act, shall have the exclusive right:

- (a) To print, reprint, publish, copy, and vend the copyrighted work;
- (b) To translate the copyrighted work into other languages, or to make any other version thereof;
- (c) To deliver or authorize the delivery of the copyrighted works in public for profit, if it be a lecture, address, or similar production.

Copyright under this new law protects all the copyrightable component parts of the work copyrighted, and all matter therein in which copyright is already subsisting under the old law, but without extending the duration or scope of such copyright. The copyright upon composite works, such as encyclopedias, dictionaries, etc., or periodicals, gives to the proprietor all the rights thereto which he would have if each part were individually copyrighted.

WHAT MAY BE COPYRIGHTED

The works for which copyright may be secured include all the productions of an author, artist, etc., but the application for registration must specify to which of the following classes the work in which copyright is claimed belongs:

- (a) Books,¹ including composite and cyclopedic works, dictionaries, gazetteers, and other compilations;
- (b) Periodicals, including newspapers;
- (c) Lectures, sermons, addresses, etc., prepared for oral delivery;
- (d) Dramatic and dramatico-musical compositions;
- (e) Musical compositions;
- (f) Maps;
- (g) Works of art; models or designs for works of art;
- (h) Reproductions of a work of art;
- (i) Drawings or plastic works of a scientific or technical character;
- (j) Photographs.
- (k) Prints and pictorial illustrations.

¹ A "Book" means a work of literary substance, not simply a list of printed words, phrases or sentences. The mere fact that an article is printed, or that it is made up in the form of a book does not make it a "book" or enable it to secure protection. The work need not, however, be entirely original—very few technical books are; it may consist either wholly or in part of old material compiled from sources common to all, but the manner of presentation of the material must be new and such that no previously existing copyright has been secured on the same arrangement. A series of mathematical tables may be copyrighted, or a collection of statistics, etc., but not a mere price list of materials, nor a book of forms, blank agreements, etc., nor cards, letter-heads or envelopes. A blank account book or other integral part of a bookkeeping system cannot be copyrighted, but a literary work, explaining the system of bookkeeping may be. Further, all copies published or offered for sale must be identical; a work provided with blank spaces so that additions can be made, making one copy different from another, does not meet the legal requirements. Nor does the law protect the individual component parts of a book or periodical; the title alone or the cover design, cannot be copyrighted, but they may, under certain conditions, be protected by the law relating to Trade-marks. A copyright on a technical work containing certain mathematical tables, formulas and statistics, does not give the author the exclusive right to such material.

The law provides that there shall be no copyright on Public Documents, either in whole or in part, provided the work is originally published by the Government; but if the Government publication is a reprint of a work already copyrighted, its publication by the Government does not annul or abridge that copyright, or authorize any use or appropriation of the copyrighted material without the consent of the copyright proprietor.

WHO MAY OBTAIN COPYRIGHT

Copyright protection is granted to an author¹ or proprietor² of any work, or his executors, administrators, or assigns; but when the author or proprietor of the work is not a citizen of the United States copyright is granted only:

(a) When he is a resident of the United States at the time of the first publication of his work;

(b) When he is a citizen of a country grant-

1. "Author" includes an employer in the case of works made by a hired writer.

2. An entry may not be made in a fictitious name, or a pseudonym, but an author may preserve his anonymity and avoid putting his name on record, if he so desires, by arranging to have some one else take out the copyright as "Proprietor." Entry may be made in the name of a firm, corporation or trustee, or in two or more names as joint authors or proprietors, and a "Proprietor" may hold the copyright in trust for the author or other legal owner.

ing reciprocal copyright rights to citizens of the United States.¹

HOW TO SECURE COPYRIGHT

Publication of Work with Notice and Registration of Copyright Work. Any person entitled thereto may secure copyright protection for his work by its publication with notice of copyright imprinted on every copy published and such person may obtain registration of claim by complying with the various conditions of the law, and upon such compliance, the Register of Copyrights will issue to the claimant a certificate of copyright.

Copyright may also be had of the works of an author of which copies are not reproduced for sale, by the deposit, with claim of copyright, of one complete copy of the work if it be a lecture or similar production; of a photographic print, if the work be a photograph; of a photograph or other identifying reproduction if it be a work of art, or a drawing. But the securing of such copyright does not exempt the proprietor from the deposit of two copies,

1. Reciprocal copyright arrangements now prevail for the benefit of authors, in Great Britain and her possessions, France, Germany, Switzerland, Italy, Denmark, Portugal, Spain, Mexico, Chile, Costa Rica, Netherlands, Cuba, and China. An American author may secure copyright in these countries under the conditions there prevailing. This is usually done through an agent or publisher abroad who is familiar with the conditions.

where the work is later reproduced in copies for sale.

Deposit of Copies of Copyright Work. After copyright has been secured by publication of the work with the proper notice of copyright, there must be promptly deposited in, or mailed to, the Copyright Office, addressed to the Register of Copyrights, Washington, D. C., **two complete copies** of the best edition of the work then published,¹ which work, if it be a book or periodical,² must have been produced in accordance with the manufacturing provisions specified below; or if the work be a contribution to a periodical, for which contribution special registration is requested, **one copy** of the issue or issues containing such contribution;³ or if the work is not reproduced in copies for sale, there must be deposited the copy, print, photograph, or other identifying reproduction already mentioned, which must be accompanied in each case by a claim of copyright. No action or proceeding for in-

1. No manuscript copies of books or articles, and no original drawings or paintings should be sent to the Copyright Office.

2. Applications may be made in advance for the entry of a number of issues of a periodical, by sending the printed title headings with the variations as to volume, number, and date written in each issue requiring a separate fee, and separate complete title.

3. Serial contributions to periodicals, including any series of articles published at intervals and under a general title, can be protected by entering the title of each installment on or before the day of its publication, and by making deposit of copy or copies as specified.

fringement of copyright can be maintained in any work until the provisions of the law with respect to the deposit of copies and registration of such work shall have been complied with.¹

The law provides that should these copies not be promptly deposited, the Register of Copyrights may at any time after the publication of the work, upon actual notice, require the proprietor of the copyright to deposit them, and after this demand shall have been made, in default of the deposit of the copies of the work within three months from any part of the United States, or six months from any outlying territorial possession of the United States, or from any foreign country, the proprietor shall be liable to a fine of \$100, and to pay to the Library of Congress twice the amount of the retail price of the best edition of the work, and the copyright shall become void.

In case the books or other articles on which copyright is claimed are mailed to the Copyright Office, the postmaster to whom they are delivered will give a receipt for them, on re-

1. In the case of works published in more than one part or volume, the title of each part or volume must be recorded as an independent work, and each requires its own separate deposit of copies and payment of fee.

quest, and will forward them to their destination without cost to the claimant.¹

Manufacturing Provisions. The printed text of a book or periodical, except the original text of a book of foreign origin in a foreign language, which is accorded copyright protection, must be printed from type set by hand or machine within the limits of the United States, or from plates made within the limits of the United States, from type set therein, and if the text be produced by a lithographic or photo-engraving process, then by a process wholly performed within the United States; which requirements extend also to the illustrations within the book, if it consists of printed text and illustrations, and also to separate lithographs and photo-engravings.

Affidavit of American Manufacture. In the case of a book, the copies deposited in the Copyright Office must be accompanied by a sworn affidavit made by the person claiming copyright or by his duly authorized agent residing within the United States, or by the printer who has printed the book, setting forth that the copies deposited have been manufactured as specified; such affidavit must also state the place where, and the establishment in

1. Owing to the difficulty of insuring the receipt of two copies of a newspaper on or before the date of publication, it is always advisable to get the postmaster's receipt, to serve, in case of need, as evidence of the mailing of these two copies, "on or before the date of publication."

which the type was set or the plates made, where the printing and binding was done, and the date of completion of printing of the book, and the date of its publication.¹

Penalty for False Affidavit. Any person who, for the purpose of obtaining registration of a claim of copyright, knowingly makes a false affidavit as to having complied with the conditions of manufacture, is guilty of a misdemeanor, punishable by a fine of not more than \$1,000, and all rights and privileges under said copyright will be forfeited.

Notice of Copyright. The notice of copyright required in the case of books consists either of the word "Copyright," or the abbreviation "Copr.," accompanied by the name of the proprietor and the year in which the copyright was secured by publication, which notice must be imprinted upon the title page or the page immediately following.² (See, for example, the notice on page following title of this book.) But in the case of copies of works specified above under subsections (f) to (k), inclusive, the notice consists of the letter C enclosed within a circle, thus (C), accompanied

1. "Date of publication" means the earliest date when copies are placed on sale or publicly distributed by the proprietor of the copyright, or under his authority.

2. In a periodical, the notice must be either upon the title page or upon the first page of text of each number, or under the title heading.

by the initials, monogram, or other symbol of the proprietor, whose full name must appear on the margin, back, base, or other permanent and accessible portion of each copy.¹

In works in which copyright is subsisting when this Act went into effect, the notice of copyright may be either in one of these forms, or in one of those prescribed by the previously existing Act.

In case of the accidental omission, or an error in the form of publication of the copyright notice, where the proprietor has sought to comply with the provisions of the law, this omission or error shall not invalidate the copyright or prevent recovery from infringement against any person who, after actual notice of

1. It is customary for the publisher to obtain the copyright when the book is printed and to have the legal notice printed in the book in his own name rather than in the name of the author, for various reasons, one of the principal of which is the protection of the copyright, as he is better able, as a rule, to give the matter proper attention than the author would be. This does not, however, affect the ownership of the copyright, which is determined by the agreement made between the author and the publisher. The publisher also attends to the copyrighting of the book in Great Britain and other foreign countries, when necessary. Many of the leading publishers have branch houses or agents in Great Britain which publish there all the works published by the house in the United States and also attend to the formalities of foreign copyright.

In Great Britain, copyright is secured by registration of title at Stationer's Hall, London, and by delivery of copies of the work free, to each of the great public libraries, as follows:

- (1) British Museum, London.
- (2) Bodleian Library, Oxford.
- (3) Cambridge University Library.
- (4) Advocate's Library, Edinburgh.
- (5) Library of Trinity College, Dublin.

In addition to this, it is necessary to print on the title page of each copy of the book, "All Rights Reserved." The fees required are very low.

the copyright, begins an undertaking to infringe it; but it will prevent the recovery of damages against an innocent infringer who has been misled by the omission of the notice; and in a suit for infringement, no permanent injunction may be had unless the proprietor reimburses the innocent infringer his outlay innocently incurred, if the court so directs.

Ad Interim Copyright protection. Where a book is published abroad in the English language before publication in the United States, an *ad interim* copyright may be secured by the deposit in the Copyright Office, not later than thirty days after its publication abroad, of one complete copy of the foreign edition, with a request for a reservation of the copyright and a statement of the name and nationality of the author or proprietor, and of the date of publication of the book; and this *ad interim* protection will have the same force as given to legal copyright for thirty days after such deposit.

If, within this period, an authorized edition of the book is published within the United States, in accordance with the manufacturing conditions specified, and if the provisions regarding deposit of copies, registration, filing of affidavit, and the printing of the copyright notice have been complied with, the copyright will be extended for the full term of copyright protection.

Duration of Copyright. Copyright protection endures for 28 years from the date of the first publication, whether the copyrighted work bears the author's name or is published anonymously or under an assumed name, and the proprietor of the copyright is entitled to renewal of the copyright for a further term of 28 years when application for renewal is made to the Copyright Office and duly registered therein within one year prior to the expiration of the original copyright.

In the case of a contribution by an individual author to a periodical or other composite work when such contribution has been separately registered, the author of the work, if still living, or if not living, his heirs, executors, or in the absence of a will, the next of kin, is entitled to a renewal of the copyright in such work for a further term of 28 years on application, as provided above.

In default of the registration of this application for renewal or extension, the copyright in any work will determine at the expiration of 28 years from the first publication.

The copyright subsisting on any work at the time that this Act went into effect may, at the expiration of the original term of copyright, be renewed by the author of the work if still living, or if not living, by his heirs, executors, or next of kin, for a further period, such that the entire term shall be equal to that secured

by this Act, including the renewal period, provided that the terms already specified regarding application for renewal shall have been complied with.

Protection of Copyright and Penalties for Infringement.¹ If any person infringes the copyright in any work protected under the copyright law, such person is liable:

(a) To an injunction restraining such infringement.

(b) To pay to the copyright proprietor such

1. The copyright covers the plan and system of the work, and the classification and arrangement of the topics, but a new edition of a work is protected by the original copyright only to the extent of the matter reprinted, new matter requiring a new copyright entry. When a new edition of a book is to be entered, an imprint should be made on the title page to distinguish the new edition from the old, so that there will be no possibility of confusing the new entry with the former entry as might easily happen if the title pages were exactly alike, and on the page following the title, the date of the new entry should be added to the former entry, but should not replace it.

In a review of a book, the reviewer may cite largely from the original work, without infringing the copyright, if his desire be truly to use the passage for the purpose of fair and reasonable criticism.

In case of periodical articles once published, even in an obscure journal, without the protection of copyright, an article cannot afterward be claimed as the property of the author or sold by him. Publication without copyright gives a manuscript to the public, and the author has no more right in it afterward than anybody else. It may be reprinted by anyone without giving credit to the original source, but it is a customary rule in journalism to give credit in the case of all matter clearly original. In the case of a copyrighted periodical, however, permission must be secured before an article can be safely reprinted in full. Ordinarily a portion of an article may be safely reprinted without expressed permission if credit be given. In fact, publishers of periodicals welcome the reprinting of such extracts as they look on it as useful advertising, and often they go to considerable expense to place articles in the hands of exchange editors and to make it easy for them to copy. Seldom is there any objection to reprinting short articles in full, but proper credit should always be given both to the author and the publication.

damages as he may have suffered due to the infringement, as well as all the profits which the infringer has made from his infringement; and in proving profits the plaintiff is required to prove sales only and the defendant is required to prove every element of cost which he claims. In lieu of actual damages and profits the infringer is liable for such damages as to the court shall appear to be just, and in assessing such damages, the court may allow the amounts stated below, but in no case shall such damages exceed \$5,000, nor be less than \$250, except in the case of a newspaper reproduction of a copyrighted photograph, where such damages shall not exceed \$200, nor be less than \$50. For every infringing copy made, or sold by, or found in the possession of, the infringer or his agents or employees, there will be an allowance of \$1.00. In the case of a lecture or address, there will be an allowance for damages of \$50 for each infringing delivery.

(c) To deliver up on oath, to be impounded during the pendency of the action, upon such terms and conditions as the court may prescribe, all articles alleged to infringe a copyright.

(d) To deliver up on oath for destruction, all the infringing copies or devices, as well as all plates, moulds, matrices, or other means

for making such infringing copies, as the court may order.

Any person who willfully infringes any copyright secured by this Act or who knowingly abets such infringement, is guilty of a misdemeanor, punishable by imprisonment for a term not exceeding one year, or by a fine of not less than \$100 nor more than \$1,000, or both, at the discretion of the court.

Any person who, with fraudulent intent, inserts notice of copyright as required by the law, or words of the same purport, in or upon any uncopyrighted article, or removes or alters the copyright notice upon any article duly copyrighted, is guilty of a misdemeanor punishable by a fine of not less than \$100 nor more than \$1,000. Any person who knowingly issues or sells any article bearing a notice of United States copyright which has not been copyrighted in this country, or who knowingly imports any article bearing such notice, or words of same purport, which has not been copyrighted in this country, is liable to a fine of \$100.

The importation into the United States of any article bearing a false notice of copyright when there is no existing copyright thereon in this country, or of any piratical copies of any work copyrighted in the United States, is prohibited.

During the existence of the American copy-

right in any book, the importation into the United States of any piratical copies thereof, or of any copies thereof (although authorized by the author or proprietor) which have not been produced in accordance with the manufacturing provisions of this Act, or any plates of the same not made from type set within the limits of the United States, is prohibited. But, except as regards piratical copies, such prohibition does not apply:

(a) To a foreign newspaper or magazine, although containing matter copyrighted in the United States, unless such newspaper contains matter printed or reprinted without authority of the proprietor;

(b) To the authorized edition of a foreign book of which only a translation in English has been copyrighted in the United States;

(c) To any book published abroad with the authorization of the author or proprietor when imported under any of the following circumstances:

When imported, not more than one copy at a time, for individual use and not for sale; but such privilege of importation shall not extend to a foreign reprint of a book by an American author copyrighted in United States.

When imported for use and not for sale, not more than one copy at a time, by or for, any library, college, school, or institution incor-

porated for educational, literary, scientific, or religious purposes.

When such books form parts of collections purchased *en bloc* for the use of societies, institutions, libraries, etc., or form parts of the libraries or personal baggage of persons arriving from foreign countries and which are not intended for sale.

But copies imported as above may not lawfully be used in any way to violate the rights of the proprietor of the American copyright or annul or limit his copyright protection, and such use, although lawful, will be deemed an infringement of copyright.

Any and all articles prohibited importation as specified, and brought into the United States from any foreign country (except in the mails), will be seized and forfeited, but all copies of authorized editions of copyrighted books imported in the mails or otherwise, in violation of these provisions, may be returned to the country of export, when it is shown that such importation did not involve wilful negligence or fraud.

No criminal proceeding can be maintained unless the same is commenced within three years after the cause of the action arose.

Assignment of Copyright. Copyright is distinct from the property in the material object copyrighted, and the sale or conveyance, by gift or otherwise, of the material object does

not of itself constitute a transfer of the copyright, nor does the assignment of the copyright constitute a transfer of the title to the material object. Copyright may be assigned, granted, mortgaged, or may be bequeathed by will. Every assignment of copyright must be recorded in the Copyright Office within three months after its execution in the United States or within six months after its execution outside the United States. When an assignment in the copyright on a specified book or other work has been recorded, the assignee may substitute his name for that of the assignor in the statutory notice of copyright.

Copyright Registration. When deposit has been made in the Copyright Office of copies of any work, an entry is made in the record books of the Register of Copyrights, and in the case of each entry, the person recorded as claimant of the copyright is entitled to a certificate of registration, containing his name and address, the title of the work upon which copyright is claimed, the date of the deposit of copies, and such marks as to class designation and entry numbers as shall fully identify the entry. In the case of a book the certificate also states the receipt of the affidavit regarding manufacture, and the date of the completion of the printing, or the date of the publication of the book, as stated in the affidavit. This certificate will be admitted in any court as

prima facie evidence of the facts stated therein. In addition to this certificate, the Register of Copyrights will furnish, on request, and without additional fee, a receipt for the copies of the work deposited to complete the registration.

The record books of the Copyright Office, together with indexes to the records and to all works deposited and retained in the Copyright Office, are open to public inspection, and copies may be taken of the copyright entries actually made in the books.

Copyright Fees. The fees payable to the Register of Copyrights by the persons to whom the services designated are rendered are as follows:

For registration of any work subject to copyright, deposited under provisions of this Act—\$1.00; which sum includes a certificate of registration under seal; but in the case of a photograph, the fee shall be 50 cents, when a certificate is not demanded.

For every additional certificate of registration made—50 cents.

For recording and certifying any instrument of writing for the assignment of copyright, or for any copy of such assignment, if not over 300 words in length—\$1.00.

More than 300 and less than 1,000 words—\$2.00.

More than 1,000 words, \$1 additional for

each 1,000 words or fraction thereof, over 300 words.

For comparing any copy of assignment with the record of such document in the Copyright Office and certifying the same under seal—\$1.00.

For recording the renewal or extension of copyright—50 cents.

For recording the transfer of the proprietorship of copyrighted article—10 cents for each title of a book or other article in addition to the fee prescribed for recording the instrument of assignment.

For any requested search of Copyright Office records, indexes, or deposits—50 cents for each full hour of time consumed in making such search.

STEPS NECESSARY TO PROCURE COPYRIGHT REGISTRATION

Abstracted from Copyright Office Circ. No. 35.

For Works Reproduced in Copies for Sale.

1. **Publish the work with the copyright notice.** The notice may be in the form, "Copyright, 19.... (year date of publication) by (name of copyright proprietor)."

2. Promptly after publication, send to the Copyright Office two copies of the best edition

of the work,¹ with an application for registration and a money order payable to the Register of Copyrights for the statutory registration fee of \$1. As to special fee for registration of photographs, see below.

In the case of books the copies deposited must be accompanied by an affidavit, under the official seal of an officer authorized to administer oaths, stating that the type-setting, printing, and binding of the books have been performed within the United States. Affidavit and application forms will be supplied by the Copyright Office on request.

For Works Not Reproduced in Copies for Sale. Copyright may also be had of certain classes of works (see a, b, c, p. 199) of which copies are not reproduced for sale, by filing in the Copyright Office an application for registration, with the statutory fee of \$1, sending therewith:

1. A work becomes the property of the public by publication, and the exclusive property of the author in it ceases as soon as by publication it has become the property of the public, unless he has complied with the requirements of the statute and secured a copyright. Permission to make a copy of a manuscript is not publication; neither is the delivery of a lecture or address. There are cases in which the conclusion that printing "for private circulation" has been held as publication, and other cases to the contrary. In practice, "publication" is supposed to take place when the book is advertised or offered to the public at a price, as a sale naturally infers publication.

Remittances should always be made by Money Order, payable to the Register of Copyrights. No money (currency or coin) postage stamps or personal checks, should be placed in any letter or other matter sent to the Copyright Office.

It is best to mail together in one parcel; the work to be registered, the application blank, affidavit (when necessary) and money order.

- (a) In the case of lectures or other oral addresses, **one complete manuscript or typewritten copy of the work.**

This privilege of registration, however, does not exempt the copyright proprietor from the deposit of **printed** copies of a lecture where the work is later reproduced in copies for sale.

- (b) In the case of photographs not intended for general circulation, **one photographic print.**
- (c) In the case of works of art (paintings, drawings, sculpture); or of drawings or plastic works of a scientific or technical character, **one photograph or other identifying reproduction of the work.**

Fees. The statutory fee for registration of any work is one dollar, including a certificate of registration under seal. In the case of a **photograph**, if a certificate is not demanded, the fee is fifty cents. In the case of several volumes of the same **book** deposited at the same time, only one registration at one fee is required.

APPLICATION FORMS

Abstracted from Copyright Office Circ. No. 12.

Applicants for copyright registration under the new law, are requested to use application forms furnished on request by the Copyright Office.

A separate form should be used for each work to be entered.

Requests for forms should specify the number and kind of forms desired, selected from the following list:

Books—For a book written by a citizen of the United States, ask for "**Application Form A¹**," and "**Affidavit Form**," specifying in the request whether the book is to be **printed from type** or plates made from type or is to be **produced by lithographic or photo-engraving process**.

For a book written by a citizen of a foreign country, printed in the United States, ask for "**Application Form A¹ Foreign**."

For a new edition of a book by a citizen or resident of the United States, ask for "**Application Form New Ed**."

For the American edition of a book in the English language on which *ad interim* copyright has been previously secured, ask for "**Application Form A²**," and "**Affidavit Form**," specifying in the request whether the book is to be printed from type or plates made from type or is to be produced by lithographic or photo-engraving process.

For a book by a foreign author in a foreign language, ask for "**Application Form A³**."

For *ad interim* copyright on a book published abroad in the English language, ask for "**Application Form A⁴**."

For a contribution to a newspaper or periodical, ask for "**Application Form A⁵.**"

Periodicals—If it is desired to make a separate application and remittance as each issue appears, ask for "**Application Form B¹.**" If it is desired to file a general application in advance and to deposit therewith a sum to cover the fees for several issues, ask for "**Application Form B².**"

For a Lecture or Address for oral delivery, ask for "**Application Form C.**"

Maps—For a published map, ask for "**Application Form F.**"

Drawing or Plastic Work—For a drawing or plastic work of a scientific or technical character, ask for "**Application Form I.**"

Photographs—For a photograph published for sale, ask for "**Application Form J¹.**"

For a photograph not to be published, ask for "**Application Form J².**"

Prints or Pictorial Illustrations—For the registration of any "print" or "pictorial illustration," which is a printed picture, complete in itself and having artistic quality, ask for "**Application Form K.**"

Affidavit Forms—For a separate affidavit form to be filed with copies of a book printed from type set within the United States or from plates made therefrom, ask for "**Affidavit Form A¹.**"

For a separate affidavit form to be filed with

copies of a book produced by lithographic or photo-engraving process wholly performed within the United States, ask for "**Affidavit Form A².**"

Renewal or Extension—For the renewal of copyright subsisting in any work for the new renewal term of 28 years as provided by the new law, available only for works originally entered since July 1, 1881, ask for "**Renewal Form R¹.**"

For the extension of an existing renewal term from 14 years as provided under the old law, to 28 years granted by the new law, available only for works already renewed under the old law since July 1, 1895, ask for "**Extension Form R².**"

(These renewal forms can only be used within a period of one year prior to the expiration of the existing term.)

No forms are issued by the Copyright Office for assignments, or licenses, nor for Postmaster's receipts for articles deposited.

XV

RELATIONS BETWEEN AUTHOR AND PUBLISHER

Choosing a Publisher. When the manuscript is completed, the question of publication arises. An author may publish his book himself or he may have it published by a publishing house, but the latter course is the more common and advisable for several very good reasons. Publication of a book involves a knowledge of the technical features of bookmaking that only experience can teach; it involves dealings with several distinct classes of people; it involves a knowledge of how to market the book, and facilities of some kind for handling it. There may be exceptional cases where an author has the business experience, the special knowledge, and the facilities, as well as the necessary financial backing, for the production and sale of his work; yet even in these cases the balance of favor is with the publisher. The work connected with the publication of his own book would necessarily take considerable time and attention from his regular vocation, and it is doubtful if this would be repaid by the small extra profit that might possibly result. The publisher has the facilities, financially and

otherwise, for the proper manufacture of the book, takes on himself the entire burden of advertising it, handling it, carrying stock, etc., leaving the author free to devote his time to his own regular calling.

Whether the publication of the book by a publisher or by the author himself yields the greater financial returns is an oft-recurring question and there have been good arguments on each side of the case. On the one side, when the book is published on a royalty basis, the publisher usually bears the cost of production and selling, advancing all the money necessary, and thus claims that he bears the entire risk and expense. On the other hand, in any arrangement where the returns to the author depend on the sale of the book, the author may argue that he certainly shares the risk, and further that after putting many weeks or months or perhaps years into the work, he may have to wait months before he gets any returns on his labor. This question is one that has had much consideration and one over which there have been bitter feelings aroused at times between authors and publishers, but those in positions to know from experience will realize that the question involves too many features to permit of a general solution. Book publishing is different in many ways from other classes of mercantile business and there are too many considerations connected with the

marketing of the book to make it a certainty that any particular book will be a financial success before it is actually offered for sale. To the writer's knowledge many likely books have proved utter failures and have brought considerable financial loss to the publisher; also many books originally published by authors with the expectation of reaping a financial harvest, and which have failed on the ground of salesmanship, have proved successful when turned over to a publisher. It is perfectly natural that the publisher, with his experience, knowledge, organization, and credit, and with an established reputation, should be able to handle this class of work to greater advantage than a man without these fundamental essentials. Further, he is in a position to advertise the book in a manner that modesty would often prohibit in the case of the author-publisher, by describing the author's professional work, and otherwise showing him to the public as an authority on his subject.

The question of financial returns is too large to take up in detail, but all things considered, it is advantageous for an author to have his book issued by one of the regular and recognized publishing houses. Having, then, decided on this method of publication, two considerations immediately arise: the proper publisher and the terms of publication.

An article for a periodical may be submitted

in its entirety or in summary form mentioned on page 211, to any periodical whose field includes the branch of the profession to which the article relates. If it proves of interest and is properly prepared, it will find acceptance. Many contributions are sent to the periodicals without expectation of payment, but where compensation is expected, it is well to mention the fact in the note accompanying the manuscript. If no such mention is made, the editor has a right to think that no compensation is expected. In regard to payments, some periodicals pay for articles soon after publication—and some do not. It is not customary for an author to send a bill, but if no remittance is received within a reasonable time, say one full month after publication of the article, the author is justified in asking for an explanation or as to when a remittance may be expected.

A different procedure is customary in connection with book manuscripts, both in the method of their submission to publishers and in the method of payment for the rights of publication. If the writer has an established reputation he will have no difficulty in placing his work to advantage, in fact, there will be competition among publishers for it. The same might be said of a manuscript treating of a branch of engineering on which there is little published literature, when the author occupies a position that warrants his having a reliable

knowledge of the subject. This holds good of both book and periodical literature. But where an author is practically unknown to the publishing world and he has had no previous dealings with publishers, and no recognized standing as an authoritative writer, there are several considerations of which he must take cognizance in his selection of a publisher and before he parts with his rights in the manuscript.

In the first place there are but few publishers who specialize in engineering literature as compared with those who handle fiction or general literature; the difference in the methods of publishing and in reaching the trade make this class of literature a specialty. An author should first ascertain who the publishers of engineering literature are and should make sure to associate himself with a reputable concern only; one having the confidence of the profession in its output, and having a financial standing that guarantees the proper manufacture and sale of the book and the payments of royalties. He should beware of the houses that offer large royalties—they cannot pay them. If the author himself does not know who the high-class publishers are, he can get the names from any one of the engineering societies and only those concerns that are known to the profession should be considered. Their financial standing can be ascertained at a trifling cost by application for a report to

any one of the large commercial agencies, such as Dun's and Bradstreet's.

The Literary Agent. Instead of handling this matter himself and dealing direct with the publisher, the author may place his manuscript with a literary agent. The literary agent is a go-between; he takes the manuscript from an author and places it with a publisher on the best possible basis, taking all the troubles and annoyances of direct dealing from the shoulders of the author. He examines the manuscript sufficiently to enable him to decide upon the best house to offer it to. He does not offer an engineering treatise to a publisher of fiction, nor a book on electro-metallurgy or mining to a house limiting itself to civil engineering works. Of several houses handling that particular class of book, his special knowledge of publishers and of their terms and methods enables him to select the one that is most energetic in pushing its sales and which has behind it a reputation for reliability. Many a good book has had a small circulation from lack of energetic salesmanship, with the consequent small financial returns to both the author and the publisher. Then the agent knows just how to offer the book to each particular publisher, and can often get into direct touch with the right man where the author would have to conduct his dealings entirely by mail and probably through subordinates. Thus

the agent takes from the author the business end of placing his manuscript, leaving the latter free to devote himself to his regular occupation without the misunderstandings, delays, and worries which he finds are the more vexatious because he has not had the experience necessary to cope with them.

When the book has been examined and found acceptable by the publisher, the agent arranges terms, making the best arrangement the manuscript and the conditions warrant. Later, if desired by the author, he collects the royalties as they fall due, takes out his commission and remits the balance to the author, with complete statement of the sales of his book, thus enabling the author to avoid dealings with any house which has a reputation for sharp practices. The literary agent can render valuable services to each party, but more often the dealings between the author and the publisher are carried on directly, without any intermediary.

Submission of the Manuscript. In submitting the manuscript to the publisher for examination, nothing, as a rule, is gained by its personal delivery. It should, and in the end it must, speak for itself; the writer confers no favor on the publisher by submitting the manuscript to him nor does the publisher confer a favor upon the author by its acceptance. It is entirely a matter of business and is more

likely to be successful if carried out in an entirely impersonal manner. The quality of the material is the ultimate test of its acceptance. Personal acquaintance with a publisher or personal explanations of the circumstances connected with the writing of the manuscript are not necessary or even useful, except to the extent of the information they convey as to the author's professional position and in cases where business information is given, to the extent of letting the publisher know that he has authority to use this information.

Some authors, desirous of making a good impression by the general outward appearance of their manuscripts, have them bound. This is a mistake as the manuscript reader does not want to hold the entire work at one time while examining it; if the sheets are loose he can take them up separately and can more easily refer to any special part of the work desired for comparisons. Further, the manuscript cannot be edited or sent to the printer in that way so in case of its acceptance it must be separated before sending it to the printer. Between two manuscripts of equal literary value, the bound runs a far greater chance of rejection than the unbound, on account of these difficulties in examination.

In all cases the manuscript should be sent flat and accompanied by the drawings or illustrations as already stated on page 128. It may

be well before submitting the manuscript itself, for the author to send a form of title page (which may subsequently be modified by technical considerations), and a complete table of contents or summary list of chapter headings and other description of the work, to the publisher, asking if submission of the complete manuscript would be welcomed. This would save time in first consideration, and make a good impression on the publisher, and save much expense and annoyance to the author himself. In such a preliminary letter, however, too much, or in fact, any, argument regarding the possible selling qualities of the book (unless it is written by an expert who **knows**) may make an unfavorable impression, as it is the business of the publisher to decide whether the book will sell or not. Bulky manuscripts should be sent by express, and should be insured, as in case of loss the value can be collected. Publishers are not responsible for the loss of manuscript except in cases where loss is due to their own carelessness or neglect. When the parcel runs into several pounds weight, the cost of transportation by express is much less than when sent by mail. It is always well to notify the publisher by separate letter of the despatch and the method of shipment of a manuscript at the time of shipment.

The author's rights in his manuscript have been discussed in another chapter from the

point of view of professional ethics and infringement of copyright, but there is another phase of the subject that should be taken up in this place. That is his rights in case of loss of his manuscript by fire or otherwise; also the question of how long an editor or publisher may retain a manuscript without putting himself under moral, if not legal, obligations to pay for it. In neither case, where the manuscript has been submitted unsolicited, has the author any real claim. By his unsolicited offer of the manuscript he puts himself at the mercy of the publisher, to suit his convenience in its examination. The publisher may have many manuscripts on hand or it may not be convenient otherwise to examine it at once and the author must wait. He may, of course, after a reasonable time, ask for a report on it, or for its return. It will be found, however, that the better class publishers conduct their business with due regard to the demands of courtesy and common justice, and give as prompt attention as possible to all manuscripts submitted to them. To prevent loss of the manuscript by accident, authors are advised always to keep an exact copy of the original sent to the publisher.

Whatever may be the law in the matter, it has been settled by custom that a publisher is not bound to return a manuscript unless postage or "express collect" instructions have

been sent him by the author, and the author has no ground for complaint at the publisher's failure to return his manuscript, if he has not complied with this common usage.

Terms of Publication. Only a writer of established reputation could set a price on his material or demand a stipulated royalty or even ask for an offer from any of the reliable publishing houses. The ordinary writer, without special authoritative reputation, must await the pleasure of the publisher, and if his manuscript is acceptable as to literary material, he must accept the offer of the publisher or take his manuscript elsewhere.

The terms offered by publishers of engineering literature vary according to the reputation of the author, character of the manuscript and its possible market, and various commercial conditions. The publisher may offer to buy the manuscript outright for a stipulated sum, or he may offer to publish it on royalty. The method of outright purchase is used generally in cases where the writer is a man of established reputation and where books are written "to order." The payment is usually made, part on delivery of the manuscript, balance on publication. Under the more common method of publishing on royalty, there are three general systems in use:

1. Publisher stands all expense of manufacture and sale and pays a percentage royalty to author.
2. Publisher and author divide expense and profits.
3. Author stands all expense of manufacture and sells to the publisher at a fixed price, the latter paying the expense of selling and handling.

The first plan is that most favored by American publishers. The royalty is sometimes paid on all copies sold, and sometimes on all copies sold after a sale of a stipulated number of copies sufficient to repay the publisher for his investment. Royalty is never paid on copies **printed**. Under this arrangement, and in fact, under any arrangement other than the outright purchase of the manuscript and all rights in it, the author is entitled, on request, to an exact statement of the sales of his book. Some publishers send monthly or quarterly statements showing number of copies sold, but it is more customary to make semi-annual settlements, accompanied by full statements of sales.

In the case of a royalty arrangement the copyright may be taken out in the name of either author or publisher, and the agreement may be for the full term of the copyright or for a briefer period.

By the second plan, a considerable portion of the risk is borne by the author, his part in the expense usually being the cost of composition and plates and sometimes of illustrations. He then remains the owner of the plates as well as of the copyright and receives a royalty on the sales, plus an extra royalty for the use of the plates. Sometimes, in the case of an unknown writer, he is asked to bear the whole expense of manufacture and is paid a larger rate of royalty. This method offers much leeway for new authors to get their books in the hands of high-class publishers.

The third method is used by writers of established reputation, for whose works there is a ready demand. The author manufactures the book, and delivers copies to the publisher as ordered, at a specified rate. This is customarily 50 per cent. of the retail price, which is paid either for the entire lot ordered, or for copies sold, by monthly, quarterly, or semi-annual remittances. In this case also the author retains all rights in the copyright and usually makes an agreement with a publisher for a specified time.

When the manufacture of the book is undertaken by the publisher, at the expense of the author, as may be in the last two methods of publication named, the author is entitled to a detailed estimate showing the outlay he

agrees to assume, and before committing himself to any agreement, should insist upon such an estimate. From these figures he should be able to judge of costs of manufacture and possible profits, and whether the proposition submitted by the publisher is fair or not.

Royalties. The usual royalty is ten per cent. of the retail selling price. A higher rate may be paid to a writer of reputation whose books are sure to have a large sale, but ten per cent. has been found by experience to be the most equitable rate on the average book. In considering this, the author should bear in mind that the publisher is showing considerable faith in the work by his willingness to assume the large liability of its manufacture and sale. If the book is a failure, he stands to lose from six or seven hundred to three thousand dollars on the venture. This amount is made up by the cost of editing, composition and plates, paper, presswork, binding, advertising and handling the book, free review copies, etc., all of which is paid by the publisher, and sometimes he is pressed very hard by an author for an "advance on account of royalties." It is therefore evident that with all these expenses, the publisher cannot afford to contract to pay the author a large royalty. The cost of an average technical book may be divided as follows, considering an edition of 2,000, and a retail selling price of three dollars:

Manufacture:	20%.....\$	.60
Royalty:	10%.....	.30
Average discount on all sales:	20%.....	.60
Expense of selling and handling:	25%.....	.75
Publisher's margin:	25%.....	.75

It will be seen, then, from this fairly average hypothetical case, that the publisher has invested \$1,200, and will have to sell nearly 900 copies before he gets back his investment. Add to this 900 copies, say 50 free copies, for the author, for reviews in periodicals, and for other purposes, and it is seen that he has left a few over 1,000 on which to make a possible profit of some \$750. This has to pay him for his risk, interest, and other items, while the author will have received on the same sales, royalties of nearly \$600, besides having a reputation established. Some books, of course, far exceed in sales the edition named above, but many fall as far below it; if some did not exceed this number, there could be no high-class publishers.

It stands to reason then that a ten per cent. royalty is fair. It is doubtful if the "margin of profit" of any other class of manufacture has to undergo such a careful and continuous division as that of the publisher of technical books, and in common fairness, the author should keep this in mind. Yet there are writers, and especially some of little

experience, who, forgetful of the necessary trade discounts and the up-keep of the publisher's establishment and organization, go from one publisher to another to bargain for higher royalties, making absurd demands, and who finally "kill the goose" by publishing their own works. A very few succeed but more fail of their purpose and many of these are ultimately saved from complete loss of their investment by some publisher taking over their book, and creating a demand for it.

Form of Agreement. Forms of agreement vary in detail. The following form gives all of the more common conditions to be considered. The carrying out of the agreement to the satisfaction of both author and publisher depends upon their mutual good will and good faith and a thorough understanding of all the terms of publication. The author should see that everything is clear and that all conditions are entered on the agreement form; that nothing is left as "assumed" or "generally understood."

Agreement made the day of 19
between of
(including his heirs and assigns), hereinafter called
the AUTHOR, and
hereinafter called the PUBLISHERS.

Grant and Copyright

Right of Translation and Abridgment

1. The said Author hereby grants and assigns to the said Publishers, the Manuscript of a work, the subject or title of which is

with the exclusive right to take out a Copyright thereof, and to renew the same, in its own name or in the name of the Author, and to publish said work during the term of the Copyright. The exclusive right of translations, abridgments and selections from the said work, or any parts thereof, is also granted and assigned by the Author to the Publishers.

Author's Guarantee

2. The Author guarantees that he is the sole owner of the said work and has full power to make this grant, and that it is in no way libellous or a violation of any copyright belonging to any other party, and that he will hold harmless and defend the Publishers against all suits, proceedings and claims which may be taken on the ground that this work is libellous or a violation of copyright.

Publication

3. The Publishers hereby agree to publish said work at their own expense in such style and quantities as seem to them best suited to the sale of the work and further agree to use their best endeavors to promote such sale, adopting such methods as are deemed most efficient by them.

Royalty

Free Review Copies

4. The Publishers agree to pay the Author a royalty of per cent. of the retail price of the work, on each copy sold, except on those sold to wholesale dealers in foreign countries, on which the royalty shall be per cent. of the American retail price, but the Publishers reserve the right to send out such free copies (on which no royalty is to be paid) for review or otherwise as may in their judgment be necessary to suitably advertise and promote the sale of the work.

Statement of Sales and Payments

5. Statement of sales shall be rendered semi-annually, in the months of January and July, for the periods ending December 31 and June 30, respectively, and payment of the amount due the Author will be made in each case within thirty days thereafter.

Author's Alterations**Index**

6. Any alterations made by the Author after the work is in type, which exceed ten (10) per cent. of the cost of composition, shall be at the expense of the Author, and any Index that may be required to complete the work, shall be considered as part of the Manuscript and shall be prepared by the Author or at his expense.

Destruction of Plates

7. If the plates or type forms be rendered valueless by fire or otherwise, the Publishers shall have the option of reproducing them or not, and if they decline to do so, then, after the sale of all copies remaining on hand, the Copyright and all rights herein granted shall be re-conveyed to the Author and this contract shall terminate.

Assignment of Contract

8. This contract may be assigned by either party, and the Assignee shall have all the rights and remedies of the original parties thereto, but only as a whole and neither party shall assign any part interest therein.

Author's Copies

9. Five (5) copies of the complete work shall be furnished on publication to the Author by the Publishers, free of all charges.

On behalf of the Publishers,

For the author.

XVI

THE LAW OF LIBEL

[Most of the following paragraphs are extracted from articles by Samuel Merrill, author of "Newspaper Libel," a complete and useful handbook (Ticknor & Co., Boston, 1883); from May's "Law of Crimes" (Little, Brown & Co., Boston, 1893); and from Bigelow's "Law of Torts" (Little, Brown & Co., Boston, 1896).]

Lord Camden's definition of libel, repeatedly approved by the courts of New York, is as follows: "A censorious or ridiculing writing, picture, or sign, made with a mischievous or malicious intent, toward government, magistrates, or individuals."

Within the scope of this definition, printed and published blasphemy is indictable as a libel, and so is printed obscenity or other immoral matter—both on the ground that they tend to deprave or corrupt the public morals. So is a publication against the government, tending to degrade and vilify it, and to promote discontent and insurrection; or calumniating a court, tending to weaken the administration of justice.

Quoted by permission from "Writing for the Press," by Robert Luce (Boston, 1907—\$1.00)—a useful compilation of material for reporters, magazine writers and authors, edited by a writer who has been brought into continual contact with newspaper work for a number of years. For the technical man, its greatest value lies in the several sections on the use of common words and phrases—Discrimination, Slang or Idiom, Obnoxious Words, Trite or Grandiloquent Expressions, Condensation by use of Simple Words, Bombastic and Fine Writing, etc.

The more common and restricted definition of libel at common law, as against individuals, is, the malicious publication of any writing, sign, picture, effigy, or other representation tending to defame the memory of one who is dead, or the reputation of one who is living, and to expose him to ridicule, hatred, or contempt. It is punishable as a misdemeanor, on the ground that such a publication has a tendency to disturb the public peace. It also gives the injured party ground for damages to be recovered by a civil suit.

Language is none the less libellous if the object of the charge is not named, provided people in the community would understand who is meant. If they would not understand who is referred to, the matter is not of sufficient interest for publication. The matter is equally libellous if directed against a family, though it is not against any individual member of the family.

It is generally immaterial what meaning the writer intended his words to convey; the effect of the publication, the manner in which readers understand it, is alone in issue. Likewise it is immaterial whether the defamatory charge be affirmative and direct, or indirect so as to be matter of inference merely, or that it is ironical, or that it is made in allegory or other artful disguise. It is enough that the charge would naturally be understood to be

defamatory by men of average intelligence.

It is not necessary that the words contain an imputation of crime. It is libellous to charge anyone with falsehood, dishonesty, insolvency, drunkenness, unchastity, or having a contagious or infectious disease of a disgraceful kind, as well as any offense against the law.

Defamation has a natural tendency to injure a man in his office, business, or occupation, within the meaning of the rule, when it strikes at his qualification for the performance of the duties of his situation, or when it alleges some misconduct or negligence in the course of performing those duties. Language may be libellous that is not defamatory of a person, but that impairs the value of his property.

The law assumes the falsity of a defamatory publication until the truth is shown, and if the publication is false, malice is also an assumption of the law, unless the publication is privileged. It is not necessary that the party publishing be actuated by a feeling of personal hatred or ill-will toward the person defamed, or even that it be done in the pursuit of any general evil purpose or design. It is enough if the act be done wilfully, and unlawfully, and in violation of the just rights of another, according to the general definition of legal malice. Injury is conclusively assumed to follow a false and defamatory publication.

In a civil action, the truth is a complete defense, but if prosecuted criminally, the person charged with libel cannot plead that the publication was true unless he can show that it was made from good motives and for justifiable ends. In any case, the writer should be sure of his ability to prove the strict truth of every part of the charge to the complete satisfaction of a jury. Even then such a publication is generally injudicious.

An unqualified retraction is no defense, but will tend in mitigation of damages.

There is a large class of defamatory publications spoken of as "privileged," to which the usual assumption that they are prompted by malice does not apply. This class includes reports of judicial and legislative proceedings, comments upon the policy of the government and upon public matters and the conduct of public men, and criticisms of theatrical, musical, artistic, and literary works.

If a report of a judicial or legislative proceeding is made fairly and in good faith, there is no civil or criminal liability. It must, however, be free from objectionable comment, whether in the body of the report or in the heading. Proceedings before church organizations, societies, and clubs, for the discipline of their members, partake somewhat of the nature of trials in the courts, and language used in them is privileged, *prima facie*, so far

as it has pertinency to the matter under consideration. An editor may use a heading properly indicative of the nature of a trial, if it does not amount to comment. A reporter may say that a person has been arrested on a certain charge, but it would, of course, be actionable to assume the guilt of the prisoner. It is libellous to quote a libellous charge which anyone else has made, unless the charge was made in open court or before a legislative body. It is no defense that the libellous language was copied from another newspaper.

Criticism cannot be defamation unless it strikes at personal character. It is protected, therefore, not because it is privileged, but because it is not defamation. However severe it may be, however unjust in the opinion of men capable of judging, so long, in England at least, as the critic confines himself to what is there called "fair criticism" of another's works, the act cannot be treated as a breach of duty. The criticism of works of art, whether painting, sculpture, monument, or architecture, falls within this rule. The conduct, too, of public men, amenable to the public only, and of candidates for public office, is a matter proper for public discussion. It may be made the subject of hostile criticism and animadversion so long as the writer keeps within the bounds of an honest intention to discharge a duty to the public, and does not make the

occasion a mere cover for promulgating false and defamatory allegations. Criticism of public men should be limited to matters touching their qualifications for the performance of the duties pertaining to the position that they hold or seek.

Any person who takes part in the publication of a libel is civilly and criminally responsible for it. This responsibility attaches to the author, editor, proprietor, printer, and seller of the book or newspaper containing the article. Proprietors, publishers, and editors are liable for the publication of libellous matter in their prints, though the publication may have been made without their knowledge or even against their orders. This is not true of news-vendors; it is held that if the alleged libel were of such a nature that a man of common intelligence could not know that it was intended for a libel, and it was not in fact known that it was, neither the editor nor the proprietor of the printing establishment or of the print would be liable.

Local statutes affect the law of libel materially, and every newspaper publisher and writer should acquaint himself with the statutes of his own State. For instance, the Massachusetts law reads:

“In an action for libel or slander, the defendant may introduce in evidence, in mitigation of damages and in rebuttal of evidence of

actual malice, acts of the plaintiff which create a reasonable suspicion that the matters charged against him by the defendant are true."

This important provision may or may not exist somewhere else.

Contempt of court is a serious offense exposing to the liability of summary punishment an attorney who resorts to the public press in order to influence the proceedings in a pending case; an editor who prints any libellous matter relative to court proceedings, tending to impair public confidence and respect in them, even though the matter is also indictable as such; a party to an impending case who before trial circulates printed statements to the prejudice of the other party; anybody who publishes a report of the proceedings of a trial contrary to the direct order of the court, or publishes such report with comments likely to prejudice the rights of the parties; and, generally, all persons who perform acts tending to interfere substantially with the efficient service of the courts in the administration of justice. Headlines likely to bias jurymen are particularly reprehensible. One may be punished for contempt by reason of publishing a libel on a grand or petit jury. It is contempt for a reporter to conceal himself in the jury room, and to report the deliberations of the jurors.

XVII

PREPARATION OF ILLUSTRATIONS FOR REPRODUCTION

There is probably no other adjunct to the making of technical literature which is so little understood and so carelessly handled as the preparation of the necessary text illustrations. And yet many publications depend for their principal value upon the illustrations which accompany the text matter. It follows, therefore, that poorly rendered illustrations will detract not only from the appearance, but also from the usefulness, of a book or paper, as compared with illustrations neatly and clearly executed, correctly drawn as to details, and legibly lettered.

Of the cuts used in printing there are, in general, five different kinds—half-tones, line-cuts, wood-cuts, stereotypes, and electrotypes, the latter two being but reproductions of the first three. Strictly speaking there are but two kinds—half-tones and line-cuts. Wood-cuts are line-cuts, but the term “line-cut” has become so generally associated with the chemically-

* The greater part of this matter is abstracted from article by Chas. W. Reinhardt, in “Engineering News,” Feby. 15, 1906.

etched zinc plate that when line-cuts are spoken of the zinc plate is the one usually referred to.

For the reproduction of line drawings, the following methods are in use:

1. Wax engraving process
2. Photo-lithography.
3. Photo-engraving on zinc.

For the reproduction of wash drawings or photographs, the half-tone process is used.

Wax Engraving Process. In the "wax process" the original, either a tracing, or a blue-print, or pencil sketch on detail paper, is photographed in the desired size upon the sensitized waxed surface of a copper plate. The outlines of the drawing are then scratched through this wax enamel down to the blackened copper backing by means of different sized gravers. The lettering on such a drawing is set up in type and stamped into the softened wax. The finished wax engraving is "electrotyped," the film-like copper covering on the wax mold is backed with type-metal, mounted "type-high," and is then ready for printing.

The wax engraving is considered by numbers of technical men as the acme of perfection, since the lines print clean and sharp and the lettering is legible. Such illustrations have a smooth and finished appearance, but they are to a large extent routine copies of poor orig-

inals, with more or less liability of errors and omissions, as every line must be ruled in by hand and all the lettering must be reproduced by setting type and impressing it in the wax. Since it is easier to get superficially passable results from a poor drawing by means of the wax process than by the processess to be described later, there is perhaps more likelihood that poor material for illustrations will be used for the wax than for the other processes. The clear, even lines and uniform, legible lettering of the wax engraving give rise to many illustrations which are of little use for purposes of careful study. This is most likely to be true when the illustrations are complex. For simple line drawings and diagrams the wax process is commendable, especially where the services of good draftsmen are not available.

Photo-Lithography and Photo-Engraving.

When an author or publisher wishes to make sure of a facsimile reduction of as perfect a line drawing as is needed for his purpose, he will have it reproduced by photo-lithography or by photo-engraving on zinc. Photo-lithography is generally employed for making large-sized illustrations for folding sheets and insets, which cannot very well be handled economically by the ordinary printing press. The originals require the same finish as those used for the zinc process. The photographs,

reduced to the desired size, are transferred to a polished lithographic stone, which, after being re-etched, is ready to print from in the lithographic press. Original photographs may also be reproduced in this way, giving the same general result as by the more familiar half-tone process, described further on.

A line engraving on zinc is produced by first printing a reversed negative, made from a large original, upon a polished and sensitized zinc plate. When inked by means of a printing roller, the ink adheres to the black lines of the plate, corresponding to those on the original drawing. Powdered resin is then sprinkled over the plate. It adheres to the ink lines, and on being heated it melts and forms a protective covering against the etching solution. This solution is next poured over the plate and is allowed to remain until it eats out enough of the metal between the lines to leave the latter in clear relief. More metal is then removed or "routed" from between the lines by means of a finishing tool. Finally, the zinc plate is mounted upon a wood block and is ready for use in the printing press.

Preparation of Drawings. The process thus briefly outlined requires in the way of original drawings pure black lines on a clear white or bluish-white background. The medium upon which to draw may therefore be white paper, tracing paper, or transparent

vellum. Buff colored paper has sometimes yielded fair results, but its use is not advisable. It must be remembered from the very outset that the drawing is to be made for a certain amount of reduction, generally large, and that consequently it must be made so that when reduced its details will still be recognizable, its lines still separated from each other, and, above all, lettering and descriptive symbols must be readily legible.

The reductions to which drawings are subjected may vary all the way from "one-half" to "nine-tenths"; that is to say, from one-half to one-tenth the original size (linear measure). An easy reduction to work for may be called the "two-thirds" reduction, or to one-third the linear measure of the original. The lines in such a drawing will have to be neither too bold nor too fine, and the lettering may be made of moderate size. As stated above, the draftsman must know from the very outset the rate of reduction and must proceed accordingly, always having in mind, for instance, that for a two-thirds reduction his lines must be three times the width of those on the final proof taken from the finished plate. This rule, however, need not be carried out rigidly, because fairly fine, black lines, having a ridge of ink on top, will always possess a value in photographing, and will consequently be recorded upon the negative. Some draftsmen are

in the habit of screwing up the nibs of the ruling pen tightly, so as to produce a fine line. The result is that the ink is squeezed out beneath the points and a gray, very fine line will result, which will either not photograph at all or come out only in spots. Therefore, it is advisable never to try to introduce too fine lines into any drawing, and it is necessary to make sure that all lines are perfectly black.

When working for reduction a drawing should always be presented in its essential details; all unnecessary center-lines, invisible and construction lines, as well as dimensioning, should be omitted. In order to make clear the construction of whatever object may have to be presented, a certain amount of outline shading, very boldly executed, may prove of great value. The shading should be heavy and decisive, the shade-lines being five or six times as heavy as the ordinary outlines. The draftsman must be quite sure in his own mind as to what part must "stand out," as, also, what portions should be shown as receding, and shade accordingly.

Center-lines should be shown the strength of ordinary outlines. The neatest symbol, and most suggestive perhaps, is the "dash and dot" line, with regular spacing between, showing dashes shorter than is customary at present. Invisible and construction lines should only be employed where clearness demands their use;

short dashes will answer very well for that style of lines. Dimension lines in a well executed drawing should be the least prominent of all, and should therefore be shown in very short, light dashes or dots, leaving open spaces for the dimensions themselves. In this way the solid outlines of the drawing are not in any way interfered with; the eye takes in at a glance the object itself; all auxiliary lines are thus made of secondary importance.

Additional clearness may at times be gained by introducing a few touches of curved surface shading, where such will aid the understanding of a certain shape, which perhaps is not otherwise made clear by any other view. Such shading, where properly executed, will greatly improve the appearance of a drawing, but is unfortunately often used indiscriminately, and in such cases detracts from the clearness of the illustration. In the style of shading there is a special tendency for the draftsman to use too close a spacing. Where portions of a view are to appear in section, the proper section-lining should conscientiously be used, being quite sure that all such parts are properly designated in this way. Parts shown in elevation should under no circumstances receive any such ruling; a very rigid distinction should always be made between parts in section and parts in elevation by the use of correct sectioning in the former only.

The lettering of a drawing which has been finished up to that point must be put in with a view of purely supplementing the drawing, and perhaps the accompanying text matter. It should all be placed so that it may be read from the base and the right-hand side of the sheet. A proper distribution of such descriptive matter in the shape of notations, titles and numerals will wonderfully enhance the appearance of a drawing—the reverse also holds good. There should be no attempt to crowd dimensions, reference letters or small notes into their respective spaces where such are too small. Instead, they should be placed boldly outside or opposite, as the case may be, and dotted reference lines used, with arrow-heads attached. This rule should be adhered to especially where there is no great amount of lettering used, so that in such a case the outlines of the figures are permitted to stand out clearly and distinctly by themselves. The style of lettering used depends, of course, greatly upon usage and individual preference; but no lettering for reduction work can compare in legibility and rapidity of execution with the so-called one-stroke Gothic lettering, either inclined or vertical. The inclined style can with advantage be used for all purely descriptive matter, dimensions, notations, etc.; the upright lettering will naturally commend itself for sub-captions, reference letters and

main divisions, which ought to be emphasized. The so-called "all-cap" lettering requires more time to construct, and is not so readily legible as the "cap-and-lower-case" lettering, which latter style has for those reasons come into almost universal favor. Main titles or captions for any reproduction can cheaply and neatly be set up in type; therefore the construction of such by hand on any drawing for photo-reproduction is nearly always useless and expensive. Underlining of lettering is undesirable, as it tends to distract attention from the outlines of the drawing itself. As the one-stroke lettering is supposed to be drawn in uniform strength of body, a specific mode of procedure becomes necessary—the direction of stroke and their sequence ought to be carefully studied by every draftsman.

The different reductions to which a drawing may have to be subjected require, of course, different sizes of lettering, and well worn pens of different makes can be used to produce just the requisite strength of body for the letters, with one application for each stroke, for the strength of the body of the letters must be in accordance with their respective sizes. For lettering on a drawing above a "five-sixths" reduction (i. e., to be reduced to one-sixth its original length), a stiff, red sable brush can be used with advantage. In order to be legible to the average reader, the lettering on any repro-

duction should not come out smaller than uniformly one millimeter high in the small lower-case letters, such as "a," "e," "m," "n," for instance. The other letters must, of course, show in proportion. Therefore the lettering on an original, which, for example, is to be reduced three-fourths (i. e., one-fourth its present length), must be made in the small lower-case letters mentioned four millimeters high, with strength of body in proportion. A drawing thus lettered up and executed will stand a much greater reduction and yet show legible and clear; nevertheless, the standards given here have been followed where absolutely good work has been essential. Corrections and erasures should be very carefully made, as the brownish tint so often noticeable on tracing-cloth where erasures have occurred will show on the negative obtained by photographing, and must be attended to separately. Such places can be covered up by painting Chinese white over the spots affected.

Very often the reproductions are overloaded with non-essential details, every center-line being shown, the dimension lines all ruled in solid, and a mass of almost illegible lettering being spread over the whole illustration. The reader of such illustration is put to considerable trouble to interpret the drawing; he has to make his own deductions, read between the lines, as it were, and often gives up the task

in disgust. All this is caused by reproducing an unsuitably drawn and lettered illustration, almost useless, at the best; certainly not serving as an ornament to the publication in which it appears.

There is no reason why many original drawings cannot be made so bold, in both lines and letters, that instead of having the original blue-printed in the ordinary cumbersome way they could simply be photographed down to perhaps one-fourth their length. Portfolios containing such reduced original drawings are exceedingly handy and serviceable, and are certainly far superior to the unwieldy and at times almost unmanageable roll of blue-prints, which otherwise have to be handled.

It may be mentioned as a curiosity that sometimes pencil-drawings on tracing paper have given good results in reproduction; the pencil lines being black enough to possess some value in the exposure.

Occasionally it becomes necessary to reproduce an illustration taken directly from some book, pamphlet or periodical. Such a reproduction cannot be reduced very much, and from the outset of such operation it must be determined just how much reduction it can "stand." The outlines of the illustration to be reproduced can with some care be retouched where ragged or broken. The principal part to be amended on such a sheet is the lettering,

which, as a rule, is poorly done and much too small. Such portions of the lettering as are essential can be pasted over with slips of white paper and the parts re-lettered to the right size upon the paper; the portions not wanted may be obliterated by simply painting over with Chinese white. The dimension lines, which generally were drawn as solid lines, can be cut up with a brush or a fine pen dipped into a solution of Chinese white, so as to produce dotted lines to designate dimensions. The center lines, likewise, can be cut up into regularly spaced, small dots and dashes; the invisible or construction lines can either be painted out altogether or similarly treated. Where outline shading is absent on reproductions, such shading may sometimes be added, if the paper possesses a fairly good surface. Such a remodeled drawing shows up very well in the proper reduction, and can be made fully as serviceable for purposes of study as a well-executed original drawing.

Half-tone Process. The principles of the so-called "half-tone process" are similar to those governing the making of line-engravings, with the exception that the original, consisting either of wash-drawing or a photograph, is photographed through a screen. The impression recorded on the sensitized plate thereby is a number of opaque dots of varying size, the white sections of the orig-

inal assuming the largest size, the dots growing smaller in the darker portion until they are completely lost in the solid blacks. The effect is a picture in dots, the varying shades and tints being depicted by various sized dots.

The impression from the reversed negative is taken upon a highly polished, sensitized copper plate, which, after repeated etchings, is ready for the wood mounting. The finishing of such a plate consists in local re-etching, a procedure which will diminish the size of the dots in places, making them print lighter in the finished picture. At times the dark or black portions may have to be "polished" in, the fine white dots in such places thereby being obliterated, so that these portions will print perfectly black. Where repeated local re-etching fails to do justice to the high lights shown in the original, such parts may boldly be engraved out by a skillful finisher, so that they may print absolutely clear white.

Preparation of Photographs. If a highly finished picture is wanted, exhibiting high lights and deep shadows, or where the judgment of the finisher is not exactly trusted, resort must be had to retouching the original photograph. On the ordinary brown or solio prints the high lights are painted in with pure Chinese white, or the same mixed with vermillion, so as to somewhat match the tone of the photograph. Deep shadows are

produced by lampblack with a trifle of vermilion added. Solid blacks can be effected by the use of India ink. The purpose arrived at in all cases is, of course, to somewhat exaggerate the contrasts, as the interposition of the screen in photographing the original will have a tendency to reduce values and more or less flatten the tints. At times the contours of an object shown may be so shadowy against the background that a little outlining in a light neutral color may be all that is required. Such outline may sometimes be done effectively in a slightly lighter color, where dark surfaces adjoin. Nowadays some beautiful work is being done by professional retouchers with the aid of the air-brush, which is worked by compressed air. The illustrations for trade catalogues, with magnificent cloud backgrounds, etc., are nearly all prepared in this way.

Most photographs will be found to have a glazed or polished surface, which will not receive water colors readily. In such cases the surface can be gone over gently with an ordinary artist's rubber, taking care not to cause any streaks or scratches. At times some rubbing with the tip of the finger to which a little powdered pumice has been applied, may be effective upon refractory portions.

Retouching of "Velox" prints can be done with neutral colors without any admixture of vermilion or brown. Here the black gener-

ally needs reinforcing. On dull Velox prints good work can sometimes be done with an ordinary H B drawing pencil.

As occasionally reproductions from line-engraving can be effectively "doctored up," so also proofs from half-tones may be prepared for a new reproduction. The proofs cut from magazines or trade-papers can be mounted, and where judiciously retouched will give very good results. The only difficulty which engravers generally encounter in this class of work is the matching of their screen upon the screen which the original contains. If this cannot be done correctly a peculiarly mottled effect upon the surface of the new plate will result.

At times it may become desirable, for one purpose or another, to entirely redraw an unsatisfactory small illustration, or to make a pen-and-ink sketch from a photograph. In such a case a "silver-print" enlargement is made from the original; the silver-print is mounted and is ready for drawing. The light-brown tint of such a print permits of distinguishing the lines drawn upon it; only the absolutely necessary outlines should be drawn upon the print with waterproof ink; parts which ought to be amended or points to be preserved and nevertheless to be modified in execution can be drawn on in pencil. After this has been done the print is bleached in an en-

ameled pan with a bichloride of mercury solution, the application of which will cause the photographic color to disappear, leaving only the pure white paper, with black ink, or occasional pencil outlines upon it. After rinsing in clean water the print is ready to continue with when dry. Such a drawing can be finished in the style advocated above; a pen-and-ink sketch can be executed purely in black and white, following the technic observed in an etching, or a newspaper illustration. Small mistakes can be rectified by painting over with Chinese white. A good rule to follow is to draw general outlines on such prints sufficiently heavy, as the reflection of the pure white background upon the black lines will have a tendency to make them appear too narrow in photographing. As a rule, all pen-and-ink portraits for periodicals are made in this manner. A drawing upon a bleached silver-print should never be exposed very long to bright light, as otherwise the original brownish tint of the print will begin to reappear, a matter which would make a good reproduction of the drawing impossible.

XVIII

THE MAKING OF A BOOK

The publisher of a large technical weekly was asked on one occasion by a reader for some copies of an issue of several weeks previous, the supply of which happened to be exhausted. When told that the copy was out of print and could not be obtained, the reader inquired, "Why couldn't you have your stationer run off a few copies for me?" This remark was not intended to be humorous; it was an inquiry made in good faith, and although an extreme case, it serves to show that many readers have little or no idea of the methods used and the work involved in producing a finished publication, either book or periodical.

Printing—"The art preservative of all arts"—may seem, to the hasty observer, like one of the simplest of arts. Any child with a simple knowledge of spelling, can arrange lettered blocks in readable words; again, with a toy press any child can stamp paper with inked type neatly and deftly. The arrangement of letters and making their impressions are rated by many as the great features of printing. These elementary processes are so simple that persons who would not attempt the work of

any craft aside from their own specialties, are confident of their ability to make, or direct the making of, a book, but in real practice this apparent simplicity disappears. The establishment that undertakes to manufacture books, must be provided with tons of type of various faces and sizes; it needs type-making and type-setting machines of great complexity and cost, large and expensive presses, and a great variety of machinery for electrotyping, folding the sheets, and binding the books. All this machinery but relieves the drudgery of manual labor, leaving still the necessity of a high degree of skill in craftsmanship, requiring for the attainment of the best results both practical experience and a theoretical knowledge of the many processes involved.

Although there are a great many factors to be taken into account in the making of a book, for general explanatory purposes, the work may be divided into two divisions: the preparatory work, or the preparation of the manuscript; and the work of manufacture, or the actual mechanical production. The first of these concerns the author and the publisher and has already been treated in detail. The second division deals with the composition, proof-reading, illustrating, paper stock, electrotyping, presswork, binding, etc. After the work is finished, a third and very important feature of the business comes into play, namely,

the marketing of the book, which involves criticisms and reviews, systems of publicity, wholesale and retail trading, and other matters not within the scope of the present work.

THE PHYSICAL SIDE OF BOOKS

To book readers, as well as to those who work among books, it is worth while to become familiar with their make-up; their binding, paper, typography, etc. To learn about these things pays, because knowledge of them adds to the sum of one's interest and because much of the knowledge one may acquire about them is of actual use in daily work, helping to judge of book values, to order bindings with discrimination, and to handle books with good judgment. Again, because in learning about the physical features of a book one not only gets useful information on several trades that are parts of the broader trade of bookmaking, but acquires also that habit of criticising or appreciating which tends to the development of good taste and to an interest in objects of art and general culture.

The physical features of a book include paper, ink, and binding, which may be either of paper, cloth, or leather. On the quality of these depends the durability of the book.

The fears that have often been expressed, are no doubt true, that the bulk of the cheaper

books published to-day will soon totally disappear as a result of bad paper and poor binding. In the past when books were considered worth printing, they were also considered worth preserving, and they wore out in service only. When they were doomed to a long undisturbed stay on the library shelf, they were often bored full of holes by worms, but after several centuries of existence, the paper remained tough and sound, the ink was black, and the stout leather or pig-skin bindings still performed their duty of firmly holding together the printed leaves. The paper in these books was hand-made of linen rags, carefully and honestly manufactured; the sheets were strongly stitched together with good flaxen thread; the binding was made of honest leather, slowly tanned, and as a result sound and long-lived; and the book thus made was a thing to be preserved and to be enjoyed, not for one lifetime only, but for generations. But an examination of the books that are produced in such quantities to-day, that have stood upon library shelves for a comparatively few years, or that have had much use, will show marked evidences of quick deterioration, principally on account of poor papers and bindings.

Papers. Book papers are made from linen, cotton, and hemp rags, and wood fibres; also among other materials, from the waste products of sugar cane, corn stalks, wild clover,

esparto, and several other plants which have a good fibre. In linen and cotton the fibres are longer than those of the other substances mentioned and as they consist of a very pure form of cellulose, which is exceedingly resistant to all changes, such rags yield papers of the highest quality and the greatest durability, and are, therefore, used mostly in manufacturing fine writing papers, ledgers, and book covers, where strength is necessary. At the present time the output of the book publishers is so great that linen and cotton rags are no longer available for the manufacture of ordinary paper, and we are forced to resort to wood pulp, the stock usually used for books being made from spruce or fir pulp.

The wood is reduced or disintegrated either by sulphurous acid or by caustic soda or by grinding, the last process being used for stock in very low grades of paper, such as newspapers and wrapping paper, but rarely for book paper. This chemically treated wood, as well as straw and esparto, have much shorter fibres than rags, and also contain compound celluloses which are subject to change, resulting in the slow disintegration of papers made therefrom. What is known as "mechanical" or "ground" wood, which is merely spruce wood ground very fine into pulp, has even shorter fibres, and contains, in addition to compound celluloses, other bodies which are sub-

ject to rapid decay. Paper made from this ground wood lasts but a very short time and almost immediately discolors on exposure to light and air, so should not be used for articles of more than a transient value. •

It should be said, however, that paper made from properly prepared chemical wood fibre has endured from the time of the practical introduction of this fibre to the present, a period of less than fifty years. Exact knowledge regarding its durability as compared with that made from rags, cannot, therefore, be had for many years, but it must not be inferred that papers made from rags alone are always more durable and stronger than papers made from other raw materials. Low quality rags or severely treated rags may yield a weaker or less durable paper than is produced from materials which in their original state are inferior. When paper is honestly and carefully made from chemically treated wood, it will doubtlessly have a considerable life, and it will probably last as long as the materials impressed upon it will warrant in this fast-moving age. But when the chemicals used in bleaching, etc., are not well washed out from the pulp, and its processes of manufacture are lowered to the cheapest point, the resulting paper becomes discolored in time, so as to be very objectionable to the eye and to be so rotten and brittle that the merest touch or strain will cause it to

break. In the presswork of this cheap type of books is often found pale ink, blurred and careless printing, and poor impressions of the illustrations.

•In the higher grades of paper, both the wood and the rag stock are treated and prepared in the same way, and only practically pure cellulose matter goes into the paper, so that papers for fine books, while made chiefly of rags, may also successfully be made of wood.

The extensive use of half-tone illustrations in the works of to-day also has a marked influence on the character of the paper, and thus upon the life of the book. The rough-surfaced, strong paper of a generation ago is altogether unsuited to the printing of this substitute for the old copper or steel-plate illustration. The low relief and finely etched surface of the half-tone requires the employment of a smooth-surfaced, highly-glazed paper for its best presentation to which fact is due some of the most serious criticisms of modern book papers. We owe to this photo-etching process a wealth of illustrations never before dreamed of, but we sometimes pay too high a price for this added factor in book-making in the impermanence of the book itself. For example, the paper used in some of the higher-class publications may be of the best of the glazed and sized variety of paper made by modern processes, and the re-engraved half-tone illustrations used may rep-

resent the highest type of modern illustrative work. Yet, dampness will cause these highly sized pages to stick together so tightly that separation means destruction, and few of the readers of these publications are aware of the fact that with a wet sponge any illustration can be completely washed off, together with the coating on the surface of the paper. On the other hand, the old wood cut and the old copper plate were proof against water; and while the page might be stained with water, the reading matter was still clear and accessible, and the book was practically uninjured by dampness—unless this was so long continued as to rot the paper.

Another objectionable feature of modern bookmaking is the tendency to “load” the paper with clay, sulphate of lime, or other white insoluble mineral matter; a treatment intended to increase its opacity and to give it a smooth surface. The quantity of “loading” contained in machine-finish and supercalendered papers varies from 2 to 30 per cent. and in coated papers from 12 to 35 per cent. The loading materials add weight, but having no fibre themselves, they weaken the paper, making it usually brittle and easily torn. Further, it is sometimes carried to such an extent that the book thus made is a perfect nuisance from the weight alone. That this loading is not necessary in all cases is shown by many instances

of books weighing but one-half as much as other books of the same size and number of pages, but made of loaded paper; both classes of books are bulky, but the one is easily handled and read, while the other is objectionable by reason of its weight. Comparing the text it will be found that the loaded book is nearly always illustrated with many half-tones, which, as has already been said, require for their proper presentation a smooth surfaced paper; the other has no illustrations, but is built up of sound paper, somewhat rough of surface, not bleached to the extent of making the color unpleasant to the eye, and the impression is good and the type is very readable. The paper stock used in the glazed and sized paper is usually of a cheaper character, as this class of paper seems to lend itself better to the process, but even were the paper in these two books of the same quality originally, the heavy pressure and the effect of the heat in passing through the rolls in the calendering process seem to take some of the life out of it and to render the paper stock more brittle and not so lasting.

While the durability of paper is controlled primarily by the kind of stock and by the methods used in making it, it also depends much on the conditions of use and storage to which the paper is frequently subjected. Inferior grades of paper are often affected by bacteria and insects which thrive wherever food,

moisture, temperature, and reaction of the material are suitable. This trouble is largely controlled by the composition of the paper as pure cellulose is but slowly attacked and then only under favorable conditions, while paper containing no starch, glue, or other nitrogenous sizing material is least attacked by insects. When paper is exposed constantly to fumes, particularly to acid fumes, such as are produced by gas lights, its durability is decreased. The life of books is shortened by their frequent and careless handling, and by the frequent folding and improper binding of the sheets, which may be either too tight or too loose.

Besides the regular paper stock used in the making of the book there is a lining paper, used to line the insides of the covers. In most books this is simply a sheet of the same paper on which the book is printed, the first and last leaves being pasted down to the covers, front and back. But many books, and especially the carefully bound ones, have lining papers selected with regard to their size and character, to the color of the leather on their backs and of the paper or cloth on their sides.

Manifestly the purchaser of paper cannot know, even by the most careful examination, that it has been made in accordance with the best methods known to paper makers, except as those methods reveal their effects indirectly to certain chemical, physical, and microscopical

tests. Not all paper need be of the highest quality and greatest durability. The quantity of raw material available will not permit this, nor do the purposes for which the paper is used always justify it. Low-grade materials may, therefore, quite properly be mixed with high-grade or used alone, the proportions of the mixture being governed by the character of the paper desired and the purposes for which it is to be used.

Finally, paper that is well made and of good materials does not always meet all requirements. From the broad economic view it is highly important that the consumer be not burdened with an unnecessary weight or bulk of material, and that raw materials be conserved. For these reasons, papers should not be needlessly heavy nor bulky. Any additional weight or bulk beyond that which is necessary to secure sufficient strength, opacity, and resistance to wear and tear results in lessened durability, greater cost of handling and transportation, needless consumption of raw materials, increased space for storage and inconvenience in handling. Book papers, as a rule, weigh 48 pounds or more per ream (24x36 ins.), and are from 0.0035 to 0.0070 inch thick. The saving in raw materials, labor, and storage space, and in freight, express, and mailing expenses which would result from the use of lighter and

better paper would go far towards paying the extra expense of making it.

Inks. Printing inks consist of a pigment, black, white, or colored, ground into a suitable varnish. The pigment is that constituent which makes the impression visible; the varnish is the vehicle which carries the pigment during the operation of grinding and during its distribution on the presses to the type, from the type to the paper, and ultimately binds it to the paper. The machinery used to accomplish this grinding and mixing consists, first, of mixers, in which the ingredients are thoroughly incorporated with each other. This being done, the resulting mixture, or "pulp," is ground up in mills formed of cylinders set in close contact. Between these rolls the pulp is passed again and again, the number of times being dependent upon the consistency of the ink and the nature of the pigments, until it is ground to the utmost fineness. The result is printing ink as it is known to the printer, varying in consistency, strength, intensity, permanency, brilliancy, drying, and other working qualities, according to the nature of the various varnishes, dryers, and pigments from which it is made.

Bindings. Bindings are customarily of paper, cloth, and leather. The paper covers are used for pamphlets and cheap editions of fiction, and are made in an endless variety of quality,

weight, and color. The great majority of books of all kinds are now bound in cloth, but until the beginning of the last century cloth was almost unknown as a material for covering a book. Books were then very costly, being printed by hand on paper made by hand, and were considered worthy of the most lasting bindings. As the life of books depends greatly on the strength and wearing qualities of the covers, such materials as wood, vellum, and leather, often reinforced with metal, were generally used. During the past century, improvements in methods and machinery so reduced the cost of the printed sheets that a demand arose for a correspondingly cheaper material for bindings. The want was satisfactorily met by the use of cloth, and from the day that it was first used it has become more and more a factor in book manufacturing. Book cloths, from their appearance and manufacture, fall into two divisions: the first, called "solid colors," consists of those in which the threads of the cloth are not easily distinguishable; the second consists of the "linens" and the "buckrams," in which each thread, with the imperfections and peculiarities of the weaving, is plainly seen and forms a large part of their picturesque effect.

The first of the "solid colors" to be used was black cloth, but they are now made in many colors, though chiefly in simple pro-

nounced shades, such as browns, blues, greens, and reds. These cloths are dyed and sized with a stiffening preparation, and are used in various patterns which are embossed on the surface during the process of manufacture.

Of the second division of cloths, in which the appearance of the threads becomes a part of the effect, there are first, the "linen" cloths. The chief characteristic of these is that the coloring used fills the interstices, but allows all the threads to be clearly seen. The irregularities of the weaving, therefore, stand out plainly and produce, to a certain extent, the appearance of woven linen fabrics. The linen cloths are specially used for school and other books which are constantly handled, as their construction shows less wear than do the solid colors.

A linen cloth, observed through a microscope which magnifies the threads to a coarseness of about forty to an inch, gives the exact appearance of a "buckram," which is well adapted to large books and which furnishes the most desirable binding of all kinds of book cloths. For technical books buckram is altogether satisfactory. It can be obtained in almost any weight, color, and smoothness or roughness of surface. It is strong, looks well, and wears well, and it will take a stamped label or a leather or paper label. It is made of the same material as the "linen" cover but is usually

heavier in the thread and therefore lasts longer.

Buckrams are sometimes embossed to imitate in part the appearance of an irregularly woven fabric called "crash." This is a special cloth which might be classed with the buckrams, and when suitably used is a very artistic material.

"Basket cloth" is still another material which could be included with the buckrams. In this grade of cloth the threads are woven in squares resembling a basket mesh, from which fact the name is derived.

For leather bindings there is hardly any part of the world that has not been drawn upon for suitable skins. These are generally goat, seal, pigskin, cowhide, calf, and sheep, and they vary in quality according to the country they come from and the manner in which they are cared for, the stall-fed animals, or those that are protected from storm and have regular food, producing the best skins. But leather for binding purposes, as now made, is not a lasting substance, and almost invariably the modern leather binding soon falls to pieces. One cause of this is that a single hide is now split into two, three, or more pieces after it has been rapidly tanned by modern processes. The leather is made weaker by the treatment it has received, and the splitting makes it weaker still; the life has gone out of it and it quickly deteriorates and will in time crumble into dust under the fingers. This is especially true of

the so-called "sheepskin" binding. Our highly-heated offices and houses also hasten this destructive action by drying out the little oil that is left in the leather. As a rule, a full cloth binding is more lasting than the full or half leather binding. But were it not the case that leather manufacturers are able, by using splitting machines, to split skins so that both parts of a skin can be used, it would be impossible for the binder to supply the needs of his customers as the output does not keep pace with the demand; in fact, binders are constantly looking for substitutes.

The most durable material for book-binding was discussed in a report of the Librarian of Congress issued in 1903. He has found that duck of suitable quality is more durable than most leathers of modern tannage and this cloth is now generally used in the Library of Congress. This material also seems to provide the best insurance known against the injury resulting from rebinding. Good duck bindings are almost indestructible.

In general, the quality and cost of bindings increase in the following order: paper, board, cloth, skiver, roan, calf-skin, russia, turkey morocco, levant morocco. Parchment, vellum, and hog-skin are classed as exceptional bindings.

Modern methods of bookmaking have doubtless come to stay, and we can and do make as good paper as our ancestors when this paper

is wanted and paid for; and our typography, presswork, and illustrations and decoration of the book will bear comparison with any product that has gone before. But this applies to expensive books only, when no money has been spared in their production. In the case of technical books, where much handling demands durability, it will pay to use good paper, good presswork, and good binding, and this is especially so in the case of books for reference.

OUTLINE OF WORK OF THE MANUFACTURING DEPARTMENT

The manufacture of a book consists primarily of the processes of transforming a manuscript into a completed volume. Few publishers make their own books; this work is a special part of the great field of printing. When the arrangements between the author and the publisher have been completed, and the manuscript has been edited, it is turned over to the manufacturing department with such general instructions regarding the make-up and appearance of the book as may have been decided upon or discussed with the author, who invariably, and sometimes unfortunately, has some preconceived notion of what his book should look like. Authors should always bear in mind that their books must be made to sell and to sell they must be made to withstand a certain amount of wear and tear, which must be pro-

vided for in the process of manufacture. The details of manufacture are much better known to the publisher than they can be to any author. It is the publisher's business to know them; so while the author is always consulted regarding his ideas, and while the publisher endeavors to meet the wishes of the author as far as practicable, the author should allow himself to be guided and advised by his publisher's superior knowledge of the subject.

Taking into consideration the details of the book, such as the subject, length, character, style, probable market, appropriate price, possible sales, and number of copies to be issued, and the wishes of the author, the book designer draws up specifications for its paper, type, sizes of type-page and trimmed page, headlines, title page, ornaments, binding, and all other details that enter into its construction. The expert book designer must be familiar with every feature of bookmaking, and every book he lays out evidences in all its parts the extent of his skill and knowledge.

The first work is the selection of a suitable style and size of type (see page 266) and size of letter-press page for the book. Then a few sample pages are set up and an estimate made of the number of pages that the book will make (see page 270). If the sample pages are not satisfactory, others are set up until a page is finally arrived at that meets the require-

ments of the book and is satisfactory to the publisher and the author.

This detail settled, the work of composition is proceeded with. Sometimes a book is set up at once in page form, but the usual practice is to send the author the first proofs in galley strips, on which all corrections and alterations should be made before the matter is divided into pages (see page 278). When the page proofs have been passed by the author, the typographer casts the electrotype plates from which the book is to be printed, unless, as is occasionally the case, it is to be printed from type, when no electrotype plates are made.

In the meantime, when the number of pages has been definitely determined, and the size of the trimmed book is decided upon, a suitable paper stock is selected and an order placed for the quantity necessary for the proposed edition. In the selection of the paper there must be considered the quality, color, and surface finish most suitable for the class of typography and illustrations that are to be used, and also the bulk, or thickness, that the book must be to make a volume of proper proportions. Upon delivery of the paper to the printer, a full-sized dummy of the book is sometimes made up for the purpose of checking the order given to the paper dealer.

If the book is to be illustrated, the drawings or photographs submitted are carefully

gone over, and, when finally approved, they are marked to show the dimensions of reproduction and sent to the engraver (see page 228). On receipt of the reproductions and after a satisfactory checking of proofs, the cuts are sent to the typographer or printer for insertion in their proper places in the plates or type-matter of the book. The pages are then made up in forms, usually of sixteen pages each, from which the sheets are printed, and as soon as printing has been completed, the printed sheets are delivered to the binder.

A cover design having been decided upon, it is turned over to the die cutter, who then cuts the brass dies used by the binder in stamping the design on the covers. The dies, when finished, are sent to the binder, who stamps off some sample covers until the proper effect has been attained. A few advance copies of the completed book are then made up and bound so that any faults or errors may be caught and remedied before the entire edition is bound.

When everything has been approved, the binder proceeds with the binding of the books. Two of the first completed copies are despatched to the Library of Congress at Washington for copyright purposes (see page 178), and copies are sent to the publicity department, which distributes a number to a selected list of periodicals for review purposes, and samples to salesmen and the trade generally.

A question has often been raised regarding vertical lettering on the backs of thin books. In bound books the title should be uniformly in one direction, and the proper direction is from the bottom upwards. In a shelf full of books, some lettered one way, and some the other, either the books lettered from the top downwards must be placed bottom down on the shelf or the persons reading the titles must read some titles upside down, or else to avoid the latter he must shift his position from the right to the left of the book. The only justification, if it can be called such, for lettering the backs from the top down, is that when a book is lying flat on a table or a desk, title page and cover upwards, the back title is then bottom side down, but the normal place for any considerable number of books, and particularly technical books, when not in use, is on book-shelves, where they naturally stand upright. With periodicals it is different. These are generally filed flat instead of upright, and hence, when lettered on the backs, the title should read from left to right.

This brief outline covers in a general way all the steps in the process of the making of a book. It would be impossible to give in the small space available a thorough explanation of the innumerable details that interweave and overlap each other in the manufacturing de-

partment, especially when it is considered that as many as forty to fifty different books are often in process of manufacture at the same time, in some of the larger publishing houses. The necessary virtue to be possessed by the workers in this department is patience; to them disappointment comes so often that it is the rule rather than the exception—from the delays due to unavoidable causes, to the blunders of stupid workmen, the broken promises and neglect of authors, and to many other causes too numerous to mention. The first-class manufacturing man must be more than a mere drudge—he must be a lover of books; and if he is such, he can withstand these disappointments and will possess the patience required to carry his work successfully over its erratic course through the press, in many instances for months, until it reaches his hands a completed work of art or a useful and substantial instrument.

Dealing Direct With the Printer. When a book is issued by a publishing house having regular dealings with printers, the publisher attends to all the labor of receiving, recording, and transmitting proofs from the printer to the author, and *vice versa*. When, however, an author undertakes to deal directly with the printer, he should make a record, with dates, of all manuscript sheets, proofs, etc., sent to the printer or received from him and should

also carry out as nearly as possible the order of receipt and dispatch of proofs, etc., as in the manufacturing department of a regular publishing house.

TYPOGRAPHY

The two greatest steps in the advancement of the printing art were the invention of movable types about the middle of the fifteenth century and the invention of the cylinder press early in the nineteenth century. Printing was done in China at a very early, but indefinite, period, but the invention of movable types in Europe is generally referred to as the invention of printing. The second advance mentioned did away with the old-fashioned hand-press, producing from 200 to 300 impressions per hour, and by the application of steam and electricity, made possible the modern web perfecting press, capable of an output of 5,000 to 100,000 complete sheets per hour of eight to thirty-two pages each, printed on both sides, and pasted and folded. A third advance, of comparatively recent date, was the invention of type-setting, or more properly, type-casting, machines. In some of these the individual types are dispensed with, the line becoming the movable unit; in others, the individual types are made and set as desired.

*For much of the matter in this chapter, I am indebted to Luce's "Writing for the Press"; De Vinne's books on "The Practice of Typography," and Carnell's small reference book, "Concerning Type."

What Types are Made of. Separate types are made of metal and wood, and are slightly less than an inch (.918-in.) high. Metal types are made of an alloy of lead, tin, and antimony, in various proportions, sometimes with a small percentage of copper or nickel, and are often copper-faced by an electro-chemical process to add to their durability. They are cast in a mold, and are nicked on the bottom for the guidance of the compositor. The larger types, such as used for poster printing, etc., are generally made of close-grained wood—apple, maple, box-wood, etc.—although celluloid is sometimes employed for the face, being glued to a wood base.

Sizes of Types. In typography the unit of measurement is the em—the name coming from the part of a line occupied by the letter m, the size of the em varying, of course, with the size of the type. An em of any type is the square of the body of that size of type. Printers have by common consent made the size known as 'pica' the standard of the printing office, and this is used in estimating the cost of composition, the wages of typesetters, and the sizes of pages. It is also used to designate the length of dashes or spaces.

Formerly it was the practice of each type-founder to establish his own standards of type sizes, which were designated by names—non-pareil, brevier, pica, etc. Owing to the absence

of a uniform standard, sizes of the same name from different typefoundries varied greatly, causing much annoyance and no little additional labor in justifying one with another. This inconvenience led to the adoption, some years ago, of the 'point system,' by which the typefounders of the United States brought about an absolute uniformity of the different sizes.

The point system is based on an inch having seventy-two fractional parts, termed 'points,' each size of type being designated according to its fractional relation to the inch, expressed in points; as, '8-point,' '10-point,' etc. Under this system the old names of type bodies (non-pareil, brevier, etc.), have gone out of general use.

These lines are set in 'Pica,' and this  is the size of the pica em. The 'point' is almost exactly one-twelfth this standard, or to be exact, it is an area .0138 inch long by .0138 inch wide, which figures out to the above mentioned division, or exactly 72 points (or 6 picas) to 0.996 inch (or 35 centimeters). There are 5251 points to the square inch. An '8-point' type is, then, one in which the em is 8 points or eight seventy-seconds of an inch square, having an area of 64 points; the '10-point' is 10 points square, with an area of 100 points, and so on. To find the number of

ems in a square inch of any given type, divide 5251 by the square of the point of the type in question. For example, to find the number of ems in a square inch of 10-point type; $5251 \div 100 = 52\frac{1}{2}$. Multiplying this by the number of square inches in the printed page, say 18, gives 945 ems to the page.

Larger sizes than 18 point are made in metal up to 120 point and in wood in multiples of pica, known as 10-line pica, 20-line pica, etc., the 12-line pica being 12 lines of pica or just one inch high. These types are used principally for ornamental work and advertising display.

Type Measurement is made on a basis of 'solid,' that is, not open spaced or 'leaded,' matter. If the matter is leaded, it is nevertheless measured by surface area and the publisher charged for it, and the compositor is paid for it, as if it were set solid. To find, or check up, cost of composition at a certain price per 1,000 ems, multiply the number of ems in one line by the number of lines. If the matter is 'solid,' multiply the number of points in the line by 72 and divide the product by the square of the number of points of an em of the type used. If 'leaded,' allow two points for the thickness of the lead, figuring 8-point matter as 10-point, 10-point as 12-point, etc., up and down the page—not across. To illustrate; to find the number of ems in an inch of a standard

TABLE OF TYPE SIZES AND DATA.

NAME OF TYPE	Point System	Stand. Book Meas' rem'ts				Approximate words to square inch		Approximate square inches to 1000 words		GENERAL USES (Shown in Size of Type Referred To.)
		Bms in Alphabet	Lines to inch	Bms in line	Lines in 1000 ems	1000 ems in 1000 ms	Solid	Leaded	Solid	
Old Style										
Excelsior.....	Less than 3½									
Emerald.....	3½									
Brilliant.....	3½									
Diamond.....	4½	18	14			72	56	14	18	Principally in Bibles. Smallest type of practical use.
Pearl.....	5	17								Advertising and tabular matter; often used in newspapers for quotations, extracts and letters embodied in articles.
Agate.....	5½	16	13			58	43	17	23	In some daily newspapers used solid for body matter and leaded for editorials. In books for side notes, foot notes and tabular matter.
Ruby.....		6	15	12	50	20	48	21	26	Newspaper editorials. Seldom used in bookwork.
Nonpareil.....	6	14	10			37	30	27	33	The most generally used size. Trade
Minion.....	7	14	9	38	20½	3	30	33	42	and class papers; weekly newspapers, small sized books, advertising matter, etc. Much used in job work.
Brevier.....	8	14	9	38	20½	3	30	33	42	Adjusts well with other sizes of type.
Bourgeois.....	9	13	8			25	20	40	50	A common magazine size. Pamphlets and books. Not a popular-sized type.

Long Primer...	10	13	7	30	33½	4½	21	17	48	59	The most used book size, especially for text books and standard fiction.
Small Pica....	11	13	6½	27½	36½	5½	17	14	59	71	Legal documents, law books and reports; common in quarterly magazines.
Pica	12	13	6	25	40	6½	14	12	71	83	Largest size ordinarily used in book work. Often used in descriptive catalogues, in reprints of addresses, etc.
English.....	14		5				11	9	91	111	Book titles and display type for advertisements
Great Primer..	18		4								Large quartos and folios and ornamental faces.

book-page set in 8-point. A standard book line of 25 ems (pica) is figured at 300 points (25x12-point, or pica). Multiplying by 72 and dividing by 64 (the square of the 8-point) gives $337\frac{1}{2}$ (338) ems. To find the number of ems in any given line of type, multiply the length of the line in inches by 72 and divide by the number of points in an em of the type in question. Thus, the 25-em pica line is $4\frac{1}{6}$ inches long: ($4\frac{1}{6} \times 72 \div 12 = 25$ ems). The length of this line is 3 inches, the type is 10-point, therefore $3 \times 72 \div 10$ gives 21.6 ems or 216 points; this multiplied by 72 and divided by 100 gives approximately 156 ems to the inch.

Estimation of Space Occupied By Manuscript. To get a rough estimation of the space that will be occupied by a given number of words when in type: (1) find the number of points to the length of line desired, also the depth of the page in points and ems; (2) divide the points of the line by the size type to be used; (3) multiply this by length of page in ems; (4) divide this product by 3, and this will be the approximate number of words to the page—solid matter. If it is to be leaded, add the thickness of the lead, usually two points, to the size of the type used in finding the number of ems to the page length.

For example, in a page of this book, the line has 216 points as shown above, and the length of the page (not counting headlines) is $5\frac{1}{8}$

inches or 369 points ($72 \times 5\frac{1}{8}$); dividing 216 by 10-point type gives 21.6 ems to the line; 369 points divided by 10-point type plus 2 points for leads, or 12 points, gives 30.7 ems,—which multiplied by 21.6 gives 663 ems; divided by 3 gives 221 as the approximate number of words to the page. If the matter were solid instead of leaded, the result would be $369 \div 10 = 36.9$ ems; $\times 21.6 = 797$ ems; $\div 3 = 266$ words.

It must be understood that this number of words to the page is approximate only as one cannot be certain that 100 words selected from one part of the manuscript will equal the same number of ems in 100 words taken from another part. There is also the matter of broken lines at the end of paragraphs to be considered. Hence it is well, when an estimation of space has been made by this process, to add 5 per cent. for safety, and then add half a page more for each chapter, to allow for breaks at the beginning and end. Finally add a page each for title, copyright, etc., and blank pages to make the total the next higher multiple of sixteen, to make up even forms.

It must be noted that the body of a type, not its face, determines its name, and as some faces are larger than the normal for the body; and others smaller, according to the taste of the typesetter or the customer, it is difficult, even for an expert, to always tell by a glance

at the face what the size may be. This can, however, be readily determined by the number of lines there are to an inch of solid matter. It should also be remembered that sizes are proportioned to each other not in the ratio of points in their name, but in that of the square thereof. Thus, the space occupied by solid 10-point matter is proportioned to the space occupied by solid 8-point matter, not as 10 to 8, but as 100 to 64, because the 10-point is sized on a scale of 10 horizontally and perpendicularly, and the 8-point is similarly sized both ways, but on a scale of 8 only.

The proportionate use of letters in printing is as follows:

e—1000	d—392	g—168
t—770	l—360	b—158
a—728	u—296	v—120
i—704	c—280	k—88
s—680	m—272	j—55
o—672	f—236	q—50
n—670	w—190	x—46
h—540	y—184	z—22
r—528	p—168	

making a total of 5,977 consonants and 3,400 vowels.

In the matter of initial letters the proportion is as follows:

s—1194	i—377	v—172
c—937	e—340	n—153

p — 804	h — 308	j — 69
a — 574	l — 298	q — 58
t — 571	r — 291	k — 47
d — 505	w — 272	y — 32
b — 463	g — 266	z — 18
m — 439	u — 228	x — 4
f — 388	o — 206	

Type Faces. In regard to type faces, while there are certain 'stand-bys' of the modern printer and certain recognized standards for book and newspaper work, the variety, in general, is almost endless. These varieties are used principally in advertising display and in job and fancy printing. There are also differences in width of face, which render type 'fat' or 'lean'; if the difference is quite marked this type is 'extended,' or 'condensed.'

Among the standard faces, ROMAN is a general name for the character used as a text letter by the English-speaking and the Latin races. It is subdivided into:

'Old style,' in which the hair-line is comparatively thick and short, and the stem is protracted to great length before it tapers to the hair-line. The serif is short, angular and stubby, making the general effect one of angularity. The figures 1 2 3 4 5 6 7 8 9 0, have ascending and descending strokes that render them undesirable for use in tabular matter. This type is not the most desirable for technical books.

'Modern-face,' or 'modern,' as it is com-

monly called, has a sharp and long hair-line, with a relatively short stem. The serif is longer, lighter, and more gracefully curved than in old style. The general effect is that of roundness, precision and symmetry. In this face the figures, 1 2 3 4 5 6 7 8 9 0 are in a line at both top and bottom.

ANTIQUE differs from roman in the boldness of its lines: stem, serif and hair-line are always of greater thickness; the corners are square, and the general effect is blackness and squareness.

GOTHIC is the name of a heavy black type that has neither serif nor hair-line. It is the plainest of all styles and is preferred by many advertisers for display purposes, but is rarely used in book work.

ITALIC is a simplified style of disconnected script. Its capitals differ from roman mainly in their inclination.

Script Types are imitations of different kinds of handwriting, but every one of them is modelled on some form of roman. This is used almost entirely for private stationery.

Among other faces used principally in advertisements, circular matter, advertising pamphlets, side headings in books, titles, etc., are the following, shown in 10-point alphabets:

CHELTENHAM

ABCDEFGHIJKLMNOPQRSTUVWXYZ &\$%
abcdefghijklmnopqrstuvwxyz !? 1234567890

Old English

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z & \$
a b c d e f g h i j k l m n o p q r s t u v w x y z ! ? 1 2 3 4 5 6 7 8 9 0

CASLON

ABCDEFGHIJKLMNOPQRSTUVWXYZ &\$
abcdefghijklmnopqrstuvwxyz !? 1234567890

DEVINNE

ABCDEFGHIJKLMNOPQRSTUVWXYZ &\$
abcdefghijklmnopqrstuvwxyz !? 1234567890

BOOKMAN

ABCDEFGHIJKLMNOPQRSTUVWXYZ &\$
abcdefghijklmnopqrstuvwxyz !? 1234567890

STRATHMORE

ABCDEFGHIJKLMNOPQRSTUVWXYZ \$
abcdefghijklmnopqrstuvwxyz !? 1234567890 &

Electrotypes. A book may be printed from the type itself or from electrotype plates made from the type. The latter save money if there are many copies to be issued and also if it is not desired to print a large number at any one time, to be stored in bound form or in sheets. The copper surface of the electrotype wears better than type metal, the number of possible impressions being from one to six hundred thousand, according to the care

with which the plates and the work are handled.

Presswork is the general name for that part of the printing process done by the presses. Newspapers are usually printed on 'cylinder' presses from rolls of paper, but books, with the exception perhaps of cheap fiction, are printed on separate sheets on 'platen' or 'flat-bed' presses. As sixteen pages (and sometimes thirty-two) are printed at a time in book work, it will be seen that the press-work is one of the smaller items of expense in most books, for compared with the cost of composition, it is not a considerable matter to run off a few hundred pages.

A laborious, and sometimes the most expensive, part of the task is the 'make-ready.' If every part of a sheet of paper were to get precisely the same impression against the face of type, equally and uniformly inked, standing exactly the same height on a perfectly level bed, the result would be complete uniformity of appearance. But unfortunately there are generally minute variations in all these details. Almost infinitesimal variations in the height of type, more commonly found where different fonts are used in the same form, require attention. These deficiencies are made up by putting pieces of paper in front of the type (beneath the sheet to be printed), which process is called 'overlaying'; or behind

the type, called 'underlaying'. It may seem strange that the thickness of a piece of paper put under part of a solid electrotpe or cut can bring out the surface above it more distinctly; but this is the case. Even a copper faced or solid leaden block weighing pounds and apparently inflexible, can be sprung enough by pieces of paper under parts of it to make the opposite surface give a stronger impression. This is not necessary for the reason alone that there may be minute variations in the thickness of the block. Even when all parts of the block are of precisely the same thickness, treatment may be desirable, by reason of the fact that it takes more pressure to bring out a dark surface than a light surface. A pressure of ten pounds may be enough for thin lines where ten times that would be required for solid black. Every part of a cut, therefore, may need a different degree of pressure; hence overlaying and underlaying call for some considerable degree of skill and care.

PROOF-READING

When the manuscript has been set in type, the printer makes a "proof" which is sent to the author for his approval. The first proof shows the condition of the type in the "galley,"* this is followed by the second, third,

* The "galley" is a flat, oblong tray, long and narrow, flanged on one or both sides, used for holding the type in position in lines.

etc. proofs as the work progresses, showing the corrections made in the previous proofs; the make-up in pages (page-proofs); the final arrangement of the type in frames for casting into plates (foundry-proofs); the casting of the type into electroplates for use in printing (plate-proofs), and finally a "press-proof" showing the work on the press, made up in forms, and on the paper to be used in the book.

Two sets of proofs are usually sent to the author—one for corrections (Author's Proof), to be corrected and returned to the printer, and one to be held by himself for reference. The adding of new matter and the changing of arrangement of old in this proof, known as "Author's Alterations," adds quickly to the cost of making of a book and should be avoided as much as possible. Before submitting the manuscript to a publisher the author should be very sure that he has finished it and that it will not later require the addition of new matter or changes in phrasing, in arrangement, for the reasons already mentioned on page 121.

If this is the case and all the suggestions previously outlined have been followed, proof-reading will resolve itself merely into the correction of typographical errors. Rules for this work are simple; the proper signs should be learned thoroughly and it should only be necessary to admonish care and accuracy in

their application. Proofreading demands careful attention. It is extremely annoying, both to author and publisher, to be compelled to insert a page or two of "Errata" into a completed work. This can be obviated by the exercise of proper care in the comparison of proofs and manuscript—assuming the latter to be letter perfect—and the distinct notation of disagreements on the proofs for the guidance of the printer. These corrections should be made with black ink or a soft, black pencil.

The "proof" is made by laying a damp sheet of proof paper over the type as it stands on the "stone"* and getting the impression by pounding it with a mallet on a wooden block, or by rolling a felt-covered cylinder over the paper. This damp paper seldom takes a sharp and uniform impression of all the type, so that a proof must never be expected to show the printing as it will appear in the finished work. Often the proof will show letters, apparently defective, but in reality but poor impressions, and as it is sometimes difficult to tell which is the case, it is best to be on the safe side and mark all letters that appear defective. When a mark has been made in the proof and is then found incorrect, it should not be erased with a rubber, but should be cancelled and marked "stet." Proofs always have a blank margin on each side of the type

* The slab or table, with a stone or metal top, perfectly smooth and level, on which forms are made up.

and every correction in the text should have a corresponding mark in this margin, on the side nearer the error and as nearly opposite it as possible. Where there are so many errors about one spot that confusion is likely to arise if corrected in the ordinary way, strike out the passage and re-write it as it is wanted in print, in the margin.

MARKS USED IN CORRECTING PROOFS

The most frequent errors are:

1. Improper Spacing of Lines and Words, which includes also errors of indentation. Errors in spacing of words and lines can readily be detected but the errors of spacing punctuation need more careful attention. For instance, observation will show that the comma and the period are set close to the words they follow, while the semi-colon and the colon are set off the distance of a thin space. Sometimes spacing between words in different lines is not uniform, on account of an effort on the part of the compositor to avoid dividing a word at the end of a line. Unless this spacing is decidedly too small or too large for good appearance, it should not be altered.

2. Transpositions and Misplaced Matter are frequently caused by the rapid operation of the type-setting machine and should be easily detected. In hand-set type there are often in-

verted letters and wrong fonts.* These are amongst the most difficult errors to detect. The author should study the appearance of similar letters and of inverted letters. For example, in the following cases, the first character is correct; the second is the same character inverted:

b—q	n—u	'—'
d—p	o—o	,—,
p—d	u—n	:—:
q—b	s—s	.—.
l—l	x—x	

3. Incorrect Spelling, meaning errors in spelling made by the compositor. A word spelled correctly in the copy might very possibly be spelled incorrectly in the proof. Such errors require close attention and a knowledge of correct spelling by the proof-reader. In this connection it should be noted that when **fi** and **ffi** come together, the logotypes **fi** and **ffi** should be used.

4. Omissions frequently occur by matter being overlooked by the compositor.

5. Too Much Matter, consisting principally in duplication of whole lines by compositor.

It is customary in city printing offices at least, for a proof to be read by the printer before it is sent to the author, for the pur-

* Meaning kind, or style of face, of type. A "font" is a complete assortment of any one kind of type, in which the quantity of each character bears a certain proportion to the rest.

pose of correcting compositor's errors. If there are many of these, they are corrected before the first Author's Proof is made; if there are very few, the corrected proof itself is sent to the author for his further corrections and approval.

In connection with the work of the compositor, Robert Luce says in his "Writing for the Press": "Count the letters, punctuation marks and spaces on the page of an ordinary novel, and you may be surprised to find that there are between one and two thousand pieces of metal in its composition. It would indeed be strange if every one of these should be accurately placed on the first attempt. The wonder is not that many changes may be required, but that good compositors can furnish such clean proofs. The chance for error is indeed so great that accuracy should never be assumed, and there should be no complaint that error is present. Eternal vigilance is the only safe rule for anyone who has to do with printers, not because they are more fallible than anybody else, but because the chance for them to do the wrong thing is so great. Give them credit for the surprisingly large percentage of accuracy."

Where words or lines are cancelled or altered, ter of the same length as the original, thus it is often possible to make the substitute mat-

obviating some of the troubles incident to a re-make-up of a paragraph or page.

In the printing office proof is read by two persons, one following the proof (the proof-reader), while the other reads from the original manuscript (the copy-holder). An author can generally read proofs by himself, as knowing his subject thoroughly, he will not need to compare every item of spelling, punctuation, spacing, etc., as the printer's proof-reader does. All formulas and mathematical expressions, tables, etc., should, however, be carefully compared.

The printer sends the author his original copy with the first proof, for comparison; with the second, or revised, proof is sent the previously corrected proof, and in this all corrections should be carefully checked. This need seldom be read entirely, as it has already been read and all that should be necessary is to see that the corrections marked have been made. But in the case of page-proofs it is important that they should be examined for errors made after all corrections have been checked. It should be seen that no lines have been transposed or omitted, especially at the bottom and top of the pages; that the running heads are correct; that tables are properly arranged and divided; that page numbers are in proper se-

quence and at the right corners, and that the end letters of lines and particularly that punctuation marks have not been dropped out in the make-up of the page.

When there is any uncertainty on the part of the printer's proof-reader in regard to spelling, construction, or arrangement, he puts a question mark (?) or writes "**Qy.**" (Query) in the margin, together with his suggestions for improvement if he has any to offer. The author should in all cases note these questions and decide the point, by writing his decision and striking out the (?) or "**Qy.**" of the proof-reader. Make no more comments than are absolutely necessary; do not argue with the printer; his duty is to set up your manuscript as you want it; merely reply "Yes" or "No" or otherwise, as briefly as possible to all questions.

A writer when he makes his final arrangements with his publisher should stipulate the fact if he wants "galley proof," as it is the custom with some publishers and printers to assume that an author's manuscript is complete and correct and not to send him any proofs until the manuscript is made up into pages.

On returning a proof to the printer mark it 'O. K.' or 'O. K. as corrected,' with your name or initials, that he may know that the proof has been read and passed by the right man.

Marks used to correct a proof sheet

- ✂ Delete: take out, or expunge.
- ⋯ Restore or retain words which have been crossed out; *set* usually being written in the margin.
- ↺ Turn a reversed letter
- te Transpose
- * A space, or more space, between words, letters or lines.
- ✓ Less space, or no space, between words or letters.
- [] Carry a word or line farther to the left, or to the right.
- ▯ Indent.
- ↗ Elevate a letter, word, or character that is sunk below the proper level.
- └ Sink or depress a letter, word or character raised above the proper level.
- └ Shows that a portion of a paragraph projects laterally beyond the rest.
- └ Directs attention to a quadrat or space which improperly appears.
- X Directs attention to broken or imperfect type
- ≡ Straighten (a crooked line or lines)
- ae Print as a diphthong.
- ¶ Make a new paragraph.
- ital* Put in *italics*.
- rom. Change from *italics* to roman.
- S.C. Put in SMALL CAPITALS.
- caps Put in CAPITALS.
- w.f. Wrong font—used when a character is of a wrong size or style
- lc. Lower case; that is, put in small or common letters
- ② Query; is this right?
- out s.o. Words are omitted, or are wanting, *see copy*.

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A marked proof

B corrected

as it is set by the compositor is placed on a rectangular brass tray (called galley). When the take is completely set by the compositor, the galley of type is handed to the proof-press operator and a galley proof is taken. The galley proof, together with its take of manuscript, is sent to the proof room. The compositor begins work on another take and the galley of type is filed away on the galley rack.

The first galley proof, known as the office proof, is read twice. The proofreader follows on the galley as the copy is read aloud by his helper, known as the copyholder. Words omitted in the type and most of the ordinary typographical errors are thus detected. The proof is read again by the reader for sense, construction and style, as it is impossible at one reading to detect all of this class.

The manuscript is held in the proof room and the office proof is sent back to the composing room. With this proof in hand, a compositor gets the galley of type and picks out the pieces of metal that are placed wrong,—corrects the type by the proof, letter by letter. After a type correction has been made (that is, the taking out of metal pieces from a line and replacing them by other type pieces), the line in every case must be justified to its exact standard length by changing the between the words.

When the galley of type has been corrected, a second proof is taken and sent to the proof room together with the office proof. The galley of type is again filed away. A proofreader carefully compares the clean proof with the first or foul proof to make certain that the compositor has made all the corrections accurately.

If any errors are detected, they are marked in ink on the new proof. This proof, accompanied by the manuscript, is then sent from the printer to the author and is known as the author's galley proof. If manuscripts could be written in the style of

the publication, and compositors could set type exactly according to copy and free from errors, then all the expensive labor of proof reading and type correcting would be eliminated. **TYPOTHESE.**

A corrected proof

TYPE as it is set by the compositor is placed on a rectangular brass tray called a *galley*. When the *take* is completely set by the compositor, the galley of type is handed to the proof press-operator and a galley proof is taken. The galley proof, together with its take of manuscript, is sent to the proof room. The compositor begins work on another take and the galley of type is filed away on the galley rack.

The first galley proof, known as the **OFFICE PROOF**, is read twice. The proofreader follows on the galley as the copy is read aloud by his helper, known as the *copy holder*. Words omitted in the type and most of the ordinary typographical errors are thus detected. The proof is read again by the reader for sense, construction and style, as it is impossible at one reading to detect all errors of this class.

The manuscript is held in the proof room and the office proof is sent back to the composing room. With this proof in hand, a compositor gets the galley of type and picks out the pieces of metal that are placed wrong,—corrects the type by the proof, letter by letter. After a type correction has been made (that is, the taking out of metal pieces from a line and replacing them by other type pieces), the line in every case must be justified to its exact standard length by changing the spaces between the words.

When the galley of type has been corrected, a second proof is taken and sent to the proof room together with the office proof. The galley of type is again filed away. A proofreader carefully compares the clean proof with the first or *foul* proof to make certain that the compositor has made all the corrections accurately. If any errors are detected, they are marked in ink on the new proof. This proof, accompanied by the manuscript, is then sent from the printer to the author and is known as the *author's galley proof*.

If manuscripts could be written correctly in the style of the publication, and compositors could set type exactly according to copy and free from errors, then all the expensive labor of proof-reading and type correcting would be eliminated. ТИПОТЕТЪ.

Making up the Book. The generally recognized arrangement of the parts of the book is as follows:

Half-title, or 'Bastard Title' (common in fiction but now seldom used in technical books),—on right-hand page, or first page of book. The reverse page should be blank.

Frontispiece, on the left-hand page, facing title. When this is used, the preceding page (or page 1) is blank.

Full Title, on the right-hand page, or page 3.

Copyright, on left-hand page (page 4), backing the title.

Dedication, when used, on right-hand page (page 5) facing copyright notice. The reverse page (page 6) is left blank.

Preface follows on right-hand page. If there is no dedication, this follows the copyright notice. There is no specified length for the preface but it is usually made up to occupy an even number of pages, so that it will close on the left-hand page.

Contents follow on right-hand page, which is followed by List of Illustrations or Text, right-hand page; then the Appendix when necessary, and Index.

Errata sheet, when inserted, should face first page of text or follow table of contents.

RULES FOR MAKE-UP OF PERIODICALS

Every publishing house has its own set of "Rules" covering its policy in regard to typography, orthography, punctuation, abbre-

viation, etc. As mentioned on page 30, these rules are sometimes made up in printed form for the benefit of contributors, whose observance of the specifications adds to the possibility of acceptance of their manuscripts, and their early publication. In many cases also it is of financial benefit to the contributors, on account of the saving of time of the publisher's editors. A typical set of such "Rules" is given below:

RULES FOR THE MAKE-UP OF
ENGINEERING NEWS.

MARCH, 1906.

[The "Century Dictionary" and De Vinne's "Practice of Typography" are to be followed in matters not here specified.]

All reading matter is to be set in minion lead or nonpareil lead or solid.

In general, original contributions, staff articles and editorials are set in minion; all matter reprinted from other sources, Letters to the Editor, news notes, and tabular matter in all articles, are set in nonpareil.

QUOTATIONS.

Quotes are to be used for names of ships, railway cars and the like, and newspapers, except Engineering News, thus: The racing-yacht "Columbia"; the private car "Albemarle"; the Toledo "Bee" of March 18, 1905.

Quotes are to be used in other cases when so marked in copy. When a word, phrase or sentence is reproduced from another place, it will be quoted. Longer quotations will be distinguished by change of type arrangement, as follows:

When occurring in nonpareil matter all quotations, and in minion matter all quotations less than 3 ins. high will be set nonpareil solid. In minion matter,

quotations exceeding 3 ins. in height will be set nonpareil lead. In nonpareil solid matter, quotations will have quotes at beginning and end of the quotation. When a quotation begins in the middle of a sentence do not indent first line.

In these and all other cases of change of type within an article (except when set off by center dashes) the two kinds of matter will be separated by two leads above and below.

NOTES.

Footnotes, or explanatory notes, preceding or accompanying articles or engravings, to be all nonpareil solid.

Notes appended to Letters will be set in minion lead, will be enclosed in brackets, and will always terminate thus: —Ed.]

Notes by the Editor appended to, or occurring in, minion matter printed under a signature, will be set minion lead, will be enclosed in brackets, and will be followed by —Ed.], as for Letter notes.

Notes and Queries are set wholly in nonpareil, using nonpareil solid for direct quotations from letters or otherwise.

TITLES AND HEADINGS.

TITLES OF ARTICLES AND LETTERS are to be in De Vinne type (8 point). Titles of articles are to be all caps, titles of letters c. & l. c.*

In articles printed under a signature, the title will be followed by the author's name and titles set in minion.

A SHORT FORM OF STADIA RECORD

By H. Franklin, Jr., Assoc. M. Am. Soc. C. E.

Sub-Heads.—Articles may be divided by sub-heads of four orders: 1. Center Heading, caps. 2. Side Heading, caps. 3. (Rarely) Side Heading, c. & l. c. (In exceptional cases, also) 4. De Vinne c. & l. c. 8-point may be used for center heads of superior order to the Roman caps.

* This rule has since been changed in regard to style of type used, and in respect to giving greater prominence to subheads.

Except for the use of De Vinne, just noted, center and side heads will be of the same size type as the article itself.

TITLES OF TABLES.—These will always be in nonpareil caps; and in following style:

TABLE II.—RADI OF ACTION OF BATTLESHIPS.
(On Basis of Most Favorable Speed, as Shown by Fig. 1.)

TITLES OF CUTS.—Titles of Cuts shall be in 7-point Gothic type, and shall be c. & l. c. for one-column (or smaller) cuts and all caps for cuts over one column wide. They will ordinarily be preceded by fig. numbers, thus:

**Fig. 3. View of Machine Shop During Erection
Showing Crane Girders.**

When a group of cuts has a common title in addition to the individual titles, the latter will be set c. & l. c., irrespective of width, while the common title will be all caps.

DASHES, RULES AND PAGE HEADINGS.

All articles will be followed by the heavy dash:

except that ed. notes, letters and news notes will use the news note dash:

But any group of ed. notes, news notes or letters will be preceded and followed by the heavy dash. Short rule dashes may be used for special purposes.

The page of Engineering News measures $8\frac{1}{2} \times 11\frac{1}{2}$ ins. over the type. Above the type a full-width rule shall be used. Heading, date, page and issue number will be placed directly over the rule, separated from it by a single lead. Each page of the main sheet of Engineering News will have the center heading

Engineering News

set in 10-point Old Style type, wide-spaced. The even-numbered pages of the Engineering Literature and Construction News supplements will have center headings of the style

Engineering Literature

and the odd-numbered pages will have the center heading

Supplement to Engineering News

in the type and arrangement noted. The outer corner of each page will bear the page number in 10-point type, and the inner corner will bear the legend

Vol. ——. No. —.

in case of the even-numbered pages, and

Month —, 19—,

in case of the odd-numbered pages.

This matter will be set level with the page heading, and two ems from the edge of the rule, the latter being the width of the three-column type body.

USE OF NUMERALS.

IN GENERAL, A.—USE NUMERALS FOR ALL NUMBERS EXCEEDING 12, and B.—SPELL OUT ALL NUMERALS FROM ONE TO TWELVE.

The exception to A is only where round numbers are used in a vague sense, as in "a thousand men taken at random," or "five hundred different reasons may be given," where they should be spelled out.

The exceptions to B are as follows:

USE NUMERALS FOR NUMBERS 1 TO 12 ONLY AS FOLLOWS:

B1. When the number is followed by a decimal or vulgar fraction. Never spell out $1\frac{1}{2}$, $2\frac{3}{4}$, etc.

B2. When the number is followed by a word having an authorized abbreviation, as "2 ft.," "6 oz.," "1 in." EXCEPTING when the statement is vague in its nature, as when the word "about" is used or implied, as in "some six feet beyond," when spell out.

B3. In a series of two or more connected or contrasted numerical statements, if some of the numbers must be numerals under rule A, use numerals for all as "2 men were killed and 16 or 18 injured."

B4. In a series of connected numerical statements where precision is implied, use numerals only; as "2 foremen, 7 masons, 8 laborers." EXCEPTING that when vagueness is implied, and the numbers are all below twelve, spell out, as in "six or seven miles," or "two men were killed and six or eight injured."

B5. In Construction News use numerals in such expressions as 7-story building, and 3-mile railway.

RULES FOR THE SEPARATE DEPARTMENTS.

TABLE OF CONTENTS—Nonpareil leaded.

ENGINEERING NEWS NOTES.—Nonpareil leaded, first words in caps as underlined.

PERSONALS.—Nonpareil leaded. One lead between items. "Mr." or other titles to precede name.

ENGINEERING SOCIETIES.—To have a nonpareil cap, side head for name of Society.

BOOK REVIEWS AND TRADE PUBLICATIONS to be set in this style:

POCKET BOOK OF MECHANICS AND ENGINEERING.—Containing a Memorandum of Facts and Connection of Fact and Theory. By John W. Nystrom, C. E. Eighteenth Edition, Revised and Greatly Enlarged. Philadelphia: J. B. Lippincott & Co. Leather; 4x6 ins.; pp. 671; 114 tables, 17 plates, and 321 figures in the text. \$3.

Then proceed with review, which for the Literature Supplement will be set in minion lead; for Trade Publications in nonpareil leaded. The number of illustrations, etc., need only be given if they are consecutively numbered in the volume.

In Engineering Literature Supplement the headings will be as follows:

CORRESPONDENCE.

Books on Cement.

That is all main divisions in De Vinne caps and all titles in D. V. c. & l. c.*

AUTHORIZED ABBREVIATIONS.

(Do not use abbreviations of QUANTITY except when numerals are used. Write "1,000 ft." or "a thou-

- | | |
|---|--|
| @ (for to or at) in tables only. | b. l. breech loading (in list of ordnance.) |
| & in names of railways or firms only, as "Brown & Smith," or "A. & B. Ry.;" or in tables when needed to save space. | B. M. (board measure) in the expression M. ft. B. M.) |
| &c. (not to be used; use etc. instead.) | bu. bushel. bushels. |
| amp. amperes. Use only exceptionally. | B. T. U. British thermal unit. (When so in copy; otherwise prefer h. u.) |
| a. m. before noon. | c. p. candle power. |
| Aug. (followed by numerals.) | Capt. (followed by name.) |
| Ave. (after capitalized name of avenue.) | ct. (cts.) cents. |
| bbl., bbis. | c. to c. (center to center), preceded either by numerals or the word "distance." |
| B. HP. brake horsepower. | C. centigrade (thermometer). preceded by symbol and numerals. |

- Chas. (followed by surname.)
 cm. centimeter.
 c. m. circular mils.
 Co. company (preceded by name in capitals.)
 Col. (followed by name.)
 cu. ins., cu. ft., cu. yd., etc.
 cu. m. (cubic meter), cu. cm., cu. mm. (c. c. may be used when bacteria per cu. cm. are meant.)
 cwt. Do NOT use.
 d. pence.
 Dec. (followed by numerals.)
 diam. (in some cases; use optional; follow copy.)
 deg. not to be used. Use ° symbol.
 ° " degrees, minutes and seconds (for angles.)
 Dr. Doctor, followed by name.
 °F. (Fahrenheit) for degrees.
 °C. (Centigrade) of temperature.
 °R. (Reaumur.)
 e. g. for example (if in copy.)
 E. HP. electrical horsepower.
 Eff. HP. effective horse-power.
 E. M. F. electro-motive force.
 Eng. News, preceding references to issues or pages, etc. (not &c.)
 et seq., and following (if so in copy.)
 Feb. (followed by numerals.)
 Fig. (followed by a numeral.)
 fr. franc. francs.
 ft. foot, feet.
 gal.; gals. gallon(s).
 Gen. (followed by name.)
 Geo. (followed by surname.)
 h. hour, in combination with "min." or "sec." as "2 h. 20 min." but spell out for "22 hours," etc.
 H. M. S. (preceding names of British ships.)
 Hon. (followed by name.)
 HP. horse-power; also I. HP. and E. HP.
 HP.-hr. horsepower-hour.
 h. p. high pressure (followed by the word cylinder.)
 h. u. heat units (also B. T. U. when so in copy, as above.)
 [beam (use the regular font cap I. Do NOT write I-bar or eye-beam.)
 . e. (if in copy; use Roman I. c.)
 I. HP. indicated HP.
 in. (ins.) inch, inches.*
 (as. (followed by surname.)
 (an. (followed by numerals.)
 kilo. (kilos.) kilometer.
 kg. kilogram.
 kVA. Kilovoltamperes.
 kW. kilowatt(s).
 KW.-hr. kilowatt-hour.
 Lieut. (followed by name.)
 lb. (lbs.)
 l. p. low pressure (followed by the word "cylinder").
 lin. lineal (ft., yd., etc.)
 M. Do NOT use for Mr.
 M. thousand.
 m. meter (or spell out if so in copy.)
 M. E. P. mean effective pressure.
 mm. millimeter.
 M. C. B. Master Car Builder (following a name or if so in copy.)
 M. ft. B. M. thousand feet (Board Measurement.)
 mi. mile. Should be used only exceptionally.
 mi. per hr. miles per hour. May be used exceptionally.
 min. minutes of time (in connection with the abbreviation "h." or "sec." only as in "2 min., 20 sec." For minutes of angles use '.)
 mos. months (if so in copy); but never (mo.") except in series.)
 MS. manuscript.
 Nov. (followed by numerals.)
 N., S., E., W., N.E., N.W., S.E., S.W. (if so in copy.)
 Oct. (followed by numerals.)
 oz. ounce, ounces.
 p. page, numerals following.
 pp. pages.
 % per cent. (except in editorials.)
 Prof. (followed by name.)
 pdr. (after numerals, referring to ordnance.)
 p. m. afternoon.
 Pub. doc. (in reviews.)
 qt. (qts.) quarts.
 r. p. m., revolutions per minute.
 R. R. Railroad, Ry. Railway (after name of companies.)
 r. f. rapid firing (in lists of ordnance.)
 s. shilling (in compound expressions like 2s. 3d. only.)
 sec. (of time in such compound expressions as "2 min. 15 sec." only; never use "15 sec." alone. For seconds of angular arc use ".")

*In such expressions as "14-in. gun," "40-yd. course," etc., use the hyphen and the singular form of the abbreviation. Hypphen also $\frac{3}{4}$ -in., $\frac{1}{2}$ -yd. where there is no whole number.

Secy. Secretary. in "Society Proceedings" and "Coming Technical Meetings."

sin, sine

cos, cosine

tan, tangent

cot, cotangent

sec, secant

cosec, cosecant

sq. ft., ins., yds., miles, m., cm., mm., etc., but never "ins. sq."

St. (after name of street only, as Seventh St., Main St.)

Sept. (followed by numerals.)

Supt. (if preceded by a name and followed by name of company without "of the.")

followed by

angular

measure in

numerals.

T-rail, T-iron, etc. (use the regular font cap T.)

U. S., U. S. S., when used as adjectives to govern other capitalized words.

vis.: (if in copy.)

vol. volume.

vs. versus if used in legal sense.

Wm. (followed by surname.)

yd. (yds.)

Z-bar (regular font cap Z.)

In addition to the above, established abbreviations like "Mass." and other names of states, f., s., etc., will be used according to general practice.

The following extra abbreviations are regularly used in Construction News:

Arch. Architect.

Asst. Engr. Assistant Engineer.

bbl., bbls.

Bd. Pub. Wks. Board of Public Works.

Boro. Engr. Borough Engineer.

Bldg. Building (following name.)

Chn. Chairman.

Ch. Engr. Chief Engineer.

Clk. Co. Clerk of committee.

City Audr. City Auditor.

City Engr. City Engineer.

City Clk. City Clerk.

City Recdr. City Recorder.

City Surv. City Surveyor.

Com. Committee.

Comm. Commission.

Comr. Commissioner.

Comrs. Commissioners.

Comr. Pub. Wks. Commissioner Public Works.

Consult. Engr. Consulting Engineer.

Constr. Engr. Constructing Engineer.

Dept. Department.

Dept. Pub. Impvts. Department

of Public Improvements.

Dept. Pub. Wks. Department Public Works.

Dir. Pub. Wks. Director Public Works.

Des. Arch. Designing Architect.

Des. Engr. Designing Engineer.

Elec. Engr. Electrical Engineer.

Engr. Engineer.

Gen. Mgr. General Manager.

Gen. Supt. General Superintendent.

Mfg. Manufacturing (in names of companies.)

Pres. President.

R. R. Railroad; Ry. Railway

(after name of companies.)

Res. Engr. Resident Engineer.

Secy. Secretary.

St. Comr. Street Commissioner.

St. Ry. Street Railway (in name of companies.)

Supt. Superintendent.

Treas. Treasurer.

vice-Pres. Vice-President.

W.-W. (in connection with names of town, company or official "Water Works.")

XIX

INDEXING AND FILING

THE CARD INDEX

The card index system is now so generally known, so widely advertised, and so variously used that little explanation of it should be necessary. Record cards can be used to advantage for almost any purpose in which there is listing and arranging to be done; the system is also adaptable to many varieties of office and field work requiring individual isolation of items. It should be thoroughly understood by every student and can easily be mastered by a study of the catalogues of any of the many supply houses which are now advertised in all periodicals and represented in almost every part of the country. For individual use a card index will save overtaking the memory in a hundred ways; it can be used to record facts pertaining to reading, household affairs, experiences, anecdotes and facts learned in conversations, correspondence, drawings, newspaper clippings, addresses, engagements, accounts, business matters of all kinds, etc.

A "Card Index File" consists essentially of cards and a case. There are variously sized and ruled cards; 'tab cards' of various designs for

special purposes, such as sub-indexing and other interior classifications; 'guide cards' for dividing the cards alphabetically, numerically, by days, months, or otherwise; and cards may be had in various colors. As it would be impossible to explain or even list in full the uses of the card index, it is needless to expand on the subject. It is used everywhere and for everything where system and time are of value, and it should be made a subject for study in the college course of every engineering student. In conclusion, the advantages of the card index may be briefly stated as follows:*

Accessibility—always get-at-able—nothing is buried and lost.

Time-saving—for the searchers after information.

Expansibility—only one end, the beginning. Can enlarge forever and still be as good.

Order—new material inserted into the exactly proper place.

Adaptability—suits every frame of mind, and every sort of business; varied classification.

System—encourages system in fast accumulating data and brings it under general heads of classification.

Divisibility—some cards can be removed for temporary use elsewhere, or for permanent transfer.

Labor-saving—nothing has to be rewritten,

*From an address on "Engineering Periodicals and the Card Index," by Prof. H. Wade Hibbard, before the Mechanical Engineering Students, Cornell University.

saves clerical labor.

Simplicity—can be operated by the inexperienced.

Contractibility—no need of retaining useless, outgrown matter.

No wasting of space—it is impossible to apportion blank spaces in books so that they will fill evenly.

Always being up to date.

Rearrangement made easy.

Substitute for memory—Supplementing it and becoming independent of existing hired memories.

Classification within the index—by using tab cards.

INDEXING OF TECHNICAL INFORMATION

To the modern professional man, the filing and recording of all obtainable information bearing on his line of work is a necessity, and the vast volume of this information renders it also a necessity that its filing and recording be carried out on a systematic basis. To a careful and methodical accumulation and classification of such information can be ascribed in many cases the very existence of a business, and its need is as fully recognized by engineers, architects, manufacturers, and professional men generally as is the need of a thoroughly comprehensive index as an adjunct of any technical publication. Every technical man who has had occasion for frequent reference to the literature of his profession or specialty, has no doubt found much fault, on the one hand,

with the unsatisfactory nature of the indexes in the majority of technical publications, and on the other hand, has been at a loss as to how to properly classify and index the technical books, catalogues and other valuable literary material that he may have collected.

The indexing of general business information, consisting usually of an accumulation of books, pamphlets, reprints and works of reference, trade publications, maps and drawings, clippings from newspapers and periodicals, notes, memoranda, data, and correspondence—in fact, everything pertaining to both the commercial and professional ends of a business, is quite a different operation from that of preparing an index for a book, and, as comparatively few are called on to undertake the latter work and all have use for the former, some space should be devoted to a discussion of various systems of indexing and their application to the requirements of engineers.

There are many engineering firms that subscribe for a large number of periodicals and maintain a staff of readers for clipping, filing and indexing every item bearing in any way on the nature of the work of the house, and in some offices this work is carried to the extent of compiling and editing the information thus obtained into the form of a periodic review. Other offices make use of the newspaper clipping agencies or other sources of supply,

but however the material is obtained, the possession of it and its proper classification are necessities, and no office can be said to be complete, up-to-date, and well regulated that does not take advantage of some of the modern methods so widely advertised to systematize its work and keep in touch with the march of industrial progress, with business prospects, and with the work of competitors.

Assuming, then, the recognition of the value of an office index, let us consider the index itself. What constitutes a good index? The word "Index" in the original Latin meant a discoverer, informer, indicator, or that which points out, for instance, the index finger. According to the Century Dictionary, an "Index" is

"A detailed alphabetical list or table of figures, names of persons, places, etc., treated or mentioned in a book or series of books, pointing out their exact positions in the volume."

This definition is limited in meaning and is in many ways faulty. It might be generalized somewhat by writing it as "An alphabetical list of key-words of topics, persons, places, and data mentioned in a book, or otherwise filed, with numerical or other references to indicate the exact location of such topics, etc., in the pages of the book or in files." Neither of these definitions, however, expresses exactly the nature of a good index, as nearly all topics are subdivided and the subdivisions are again sub-

divided. There is no "standard" system of indexing—the requirements of each particular office constitute a problem calling for individual solution; but while no broad rules can be laid down which will cover all possible conditions, some general principles can be formulated that will serve as a guide. A good general system is that in use in an office where information of all kinds is filed, where the character of the service to be rendered requires consolidation, and the same reference library is to be used by several companies.

The Industrial Library Index. Such a library is provided by the firm of Stone & Webster, of Boston. This firm handles the executive affairs of a large number of companies, including electric railway and lighting corporations, gas lighting companies, chemical and electro-chemical companies, etc., with interests scattered over an area extending from Puget Sound to Porto Rico, and from Texas to Cape Breton.

In the bookcases, and in substantially the following order, are shelved dictionaries, encyclopedias, books on rhetoric, on insurance, on finance, periodical indexes, publishers' lists, legal, engineering, and statistical books (the last a large class, including municipal, state, and government reports—mostly domestic, a few foreign); also the bound numbers of some twenty-five engineering and political journals,

the larger part dating from 1900. Other periodicals that come, but are not bound, would bring the number to about fifty weeklies and monthlies regularly received. Topographic and other maps, atlases, and photographs, make up the rest of the "book file," which totals between 2,000 and 3,000 items.

The "document file," with its 15,000 or more private documents, including propositions (for example, railway, lighting, and other business schemes), statistical and financial data, legal matters, agreements, illustrations, and engineering and miscellaneous papers, is, of course, the more vital part of the library, and represents much accumulated data and experience.

For the majority of questions, as in all libraries, an "up-the-sleeve" knowledge, a familiarity with the titles and file numbers, with the locations of the various books on the shelves, and with their general scope and contents, is of manifest importance. To know that the population of most cities is given in the almanacs; to know that the value of the exports of Galveston is given in the Statistical Abstract of the United States; that a discussion of "shall and will" is in the rhetorics; that an epitome of the industrial aspects of Salt Lake City is to be found in the encyclopedias; and to know in a general way what special books on gas engines, or steam turbines, or reinforced concrete, and so on, are on file;

and to be able to get these books with one's eyes shut, as it were—such faculties may legitimately be expected of those who have had much to do with the books of the library.

Frequently, however, a list of substantial references is wanted on a given subject, as, for instance, "Motor cars on steam railroads," which might be found listed in the indexes in the volumes of a railway journal. But this might mean looking through the indexes of several volumes with very likely the inconvenience of having to take the volumes from a rather inaccessible shelf.

A simple way to escape much of this work is to have a separate set of indexes. Such a set of duplicates maintained in this library has proved a great convenience. The collection dates mostly from 1900 and includes the indexes to sixteen different technical journals. And yet, convenient as these indexes are, they do not indicate the length of the articles, while the titles are so brief that one often has but little clue as to the scope until he sees the articles themselves.

Many librarians and engineers make use of items describing the various important articles, clipped from published indexes such as the "Technical Press Index," which are pasted on index cards, thus making available for ready

reference an index always up-to-date. At the library of Stone & Webster, the slips are pasted on sheets, 8x10½ inches, each in its own class, so that in looking for "Motor Cars," the desired references are to be found on certain of the sheets whose general heading shows that they have to do with railway affairs. This classification in sheets has the disadvantage of less detail in classification than is possible with separate cards, but it is claimed that this is in a measure compensated for by greater facility of reference, as it is far quicker work to glance over a sheet containing twenty or more items than to examine the same number of index cards.

The next step following the system of compiling and sorting the material is the method of classification, and for this a numerical grouping of the subjects, with a decimal notation indicating the subdivisions, is the best. The nearest approach to a "standard" and the most generally used system of this kind is the Dewey Decimal System for libraries.

One of the prime requisites of a good index is the method of keeping it up to date; unless it is methodically handled in this regard many items are liable to be neglected. Everything should be disposed of at once—publications of all kinds should be indexed as they are received, and a strict adherence to this principle

will make the index one of the most valuable working tools an engineer or an engineering firm can be possessed of.

The following method of indexing and filing technical information contained in periodicals, is given in a letter in "Engineering News":*

Upon the arrival of each journal it is scanned and all material worth keeping is marked. The journal is then cut down to minimum size by removing all unmarked sheets and the remainder bound into a unit with paper fasteners.

These units are each given a number and are filed in boxes in numerical order, which likewise correspond to the order of their date. Before being put away, however, they are indexed in a card indexing system as described below.

A topical index of engineering subjects based upon the decimal system is used. This index is made to follow as rational a plan as possible and after a few weeks of use becomes sufficiently memorized to enable one to locate cards without reference to the topical index.

Each topic has a card made out according to the plan shown below and each article or other reference is entered on a separate line of the card with its serial number, date and source opposite to it. Instead of cards, sheets in a loose leaf note book may be used:

E— 630	Electric Locomotives.
1041.....	New York Central.....E. W. 1-5-08
1096.....	B. & O.....E. R. J. 2-6-08
1143.....	N. Y., N. H. & H.....E. N. 4-21-08
1220.....	Brooklyn Rapid Transit.....G. E. R. 6-18-08

(The letters in the last column are abbreviations of technical journal titles.)

*Eng. News, Jany. 16, 1911. Correspondence by Wm. A. Del Mar and O. G. Pratt, 335 Madison Ave., New York.

Size of card is 4x6 inches.

The advantages of this system are as follows:
Compared with Simple Indexing:

(1) Articles are available in the office at short notice.

(2) Bulk of data filed is reduced to minimum.

(3) The trouble and expense of book-binding is avoided; and the data are not temporarily lost to the office during book-binding.

(4) The filing of articles from miscellaneous journals, which are not subscribed for, is still possible.

(5) When all the available data on a given subject is required, one's desk is not loaded with dozens of ponderous volumes.

Compared with Simple Clipping:

(1) Articles on the same sheet may be filed without having duplicate copies.

(2) Detail topics in a general article are easily cross-indexed.

(3) It is much easier to determine whether any particular article has been filed than it is with the clipping system, especially when the file becomes voluminous.

(4) If an article cannot be found by topic, it can be found by date, as the data sheets are filed in order of date.

(5) When thinning-out becomes essential, it is not necessary to go through the whole file, but only through the oldest portion and the obsolete matter eliminated.

(6) A convenient method is provided for

indexing articles in books and periodicals which are not owned or subscribed for.

(7) And last, but not least, the time which would be spent in cutting, assorting and pasting clippings is more pleasantly and profitably utilized in carefully scrutinizing the articles so that all topics of interest may be properly indexed, and as there is no temptation to defer this sort of filing until sufficient papers have accumulated for one or two days' work (as is the case with the "paste pot and shears" system), it is much more thoroughly done, and in consequence much valuable information is acquired which would otherwise be entirely overlooked.

An Indexing System for Both Field and Office Use.* The following system of indexing engineering data for both field and office use has been found very convenient in consulting engineering practice. The engineering subjects are numbered from one upward. Loose covers are prepared and each cover is given a number corresponding to the number of one of the subjects. The covers are made of stiff, brown paper, folded to about 8x11 inches, and provided with a flap.

Any engineering paper or articles in any periodical, or any data whatsoever, that is worth preserving, is cut out and filed in the loose cover. The number of the paper filed will be a fraction, the numerator showing the number of the subject, and the denominator

*System used by Albert I. Frye, Consulting Engineer, 90 West St., New York City.

showing the number of the paper or article filed under that subject. It is convenient to limit the number of papers filed in each cover to about fifty.

Now index these papers in duplicate, on typewritten sheets, pasting one copy of the index sheet on outside of cover, the other copy to be filed in a loose-leaf index. Certain abbreviations can be used in the indexing, so that a vast amount of data can appear on a single line in condensed form, thus giving a fairly full description of the article. In case a paper filed under one subject contains another article on another subject (on the reverse side), a cross-reference is made.

Papers filed in this manner are very handy for the consulting engineer, as all references on any one subject are brought together in such condensed form that they can readily be tucked into a small grip when wanted in traveling.

Classification System for Library. In 1895, Prof. F. R. Hutton, then Secretary of the American Society of Mechanical Engineers, was called on to decide on a system to be used in classifying and cataloguing the society's library. Prof. Hutton wrote a paper on his work for the society from which the following classification of subjects has been abstracted. In this paper he states that without prepossession of any particular system, he asked him-

self: "What is the catalogue of a library of engineering for?" The immediate reply would seem to be: "To enable a visitor to the library in search of its sources of information on a certain subject, to find what the library contained for his purposes and where it might be found."

If this conception of the function of a library card catalogue is sound the catalogue ceases to be an alphabetical list of mere book titles and becomes a list of subjects, or an "*Index Rerum*," and under each subject should be found the books in the library, each upon its own card, which treat of that particular subject—either by title or author when the book is upon that subject entirely, or by reference to another subject in the catalogue. On other cards behind these should be found also, those book titles in which besides their major subjects, the topic in question is treated in a subordinate manner. The single cards under each subject, besides title and author, would have such numbers as would indicate the location of the book in alcove or section and their location upon the shelf and in succession so that it can be readily found and returned.

The classes adopted for the library were the following:

1. Dictionaries, Encyclopedias, Engineers' Pocket-books, Logarithmic Tables, etc.
2. Periodicals and Magazines
3. Transactions of Societies

4. Trade Catalogues
5. Pure or Natural Sciences
6. Industrial Arts (not engineering, metals and metallurgy, nor wood-working)
7. Mining and Metallurgy
8. Strength of Materials and Testing Machines
9. Drawing and Machine Design.
10. Timber, Carpentry, Joinery and Wood-working
11. Metals and Metal Working
12. Mills, Manufactories, and Shops
13. Heat, Fuel, and Heat Engines (not steam)
14. Steam Engineering (stationary) and Motors for Mills, Shops, and Power Plants
15. Power Transmission
16. Electrical Engineering
17. Railway Machinery and Equipment
18. Marine and Naval Engineering
19. Aerial Transportation
20. Military Engineering, Ordnance, and Sea Coast
21. Hydraulic Engineering (not motors)
22. Sanitary and Municipal Engineering
23. Structural (also called Civil Engineering)
24. Fine Arts, Architecture
25. Technical Miscellany
26. Law, Patents, Inventions
27. Medicine and Surgery
28. Philosophy, Mental Science, and Religion
29. Social Science, Economics, Philanthropy, Ethnology, Anthropology
30. Philology, Literature, Language
31. History
32. Fiction, Essays, Poetry, Humor
33. Library Methods and Literature; Rarities

Each of these classes is divided into sub-

classes, as occasion requires. The list of subclasses is given at length in the original paper from which the above is abstracted, and which was presented before the society.

Library of Congress Index Cards. When the Library of Congress, at Washington, moved from its old quarters in the Capitol to its new building in 1897, work was started on the recataloguing, according to modern ideas, of the enormous number of books and pamphlets which up to then had been classed and listed on a most primitive and complicated system. As a part of this work, which was expected to take about twenty years to complete, cards bearing the cataloguing title of the books were printed and a division of the library established to take charge of the distribution of the cards to any person or institution willing to pay a nominal sum for them. The recataloguing is now approaching completion, and there are available for distribution, index cards of all books in the library except those under a very few classes.

This is a source of bibliographical information unknown to many people. It is especially of value to engineers, because all the various fields of technology have now been covered. In addition to being the legal depository of all books copyrighted in the United States, which means that all modern American books must be included upon the shelves, the Library of Congress has a generous purchase fund,

which is devoted to foreign and ancient books. An engineer wishing a list of books on his specialty or on technology at large could do no better than to procure it from this source.

The cards are in the regular 3x5-inch size. Each book or set of books is listed on a separate card giving title, author, publisher, date of publication, size, brief summary of contents and finally, a list of headings under which the subject headings may be made. The price per card ranges from one to three cents, according to the manner of ordering. Full information is given in a handbook issued by the Library of Congress, entitled "L. C. Printed Cards; How to Order and Use Them."

INDEXING AND FILING OF TRADE PUBLICATIONS.

Classification. What has been said relates especially to the indexing and filing of general engineering information, but nowadays every manufacturing concern, every engineering and construction company, many libraries and individuals preserve the various trade publications that come to them, relating to machinery, supplies, etc., in which they may be interested. This class of semi-technical literature is daily increasing in volume, and while much of it is only of passing interest, there is also much that contains information of permanent value which is well worthy of preservation, and no

engineering firm may be said to be up to date and thoroughly alive to its own interests which ignores it.

Aside from the main object of trade catalogues, which is presumably to sell the goods described therein, there is an importance to be attached to some of them as industrial literature that is worth recognizing. General treatises exhibiting the principles and practice of any branch of engineering naturally hesitate to describe in too great detail the product of any single firm, but the men working daily with tools and engines of special type find what they want to know in the elaborate descriptive catalogues of the makers. Then engineering books are depending more and more upon trade literature for illustrative material, not to mention occasional appropriations of text, because of the superior quality of the design and execution of the drawings so published, and the precise character of the information. Again, many of these catalogues are worth preservation as remarkable products of the printers' art. But aside from these various outside considerations, they contain that intimate information which the buyer and user of present-day devices most needs; the buyer therefore wants to keep them and on account of their quantity, he needs some system for their preservation and easy reference.

The system of indexing which is here briefly

described has proved satisfactory in an office where many trade publications are received daily. The first work is that of elimination. Purely advertising matter, or so-called "Reminders," are thrown out; and mere price-lists are also generally rejected, especially where they are not specific enough to give useful record information. But catalogues, priced or unpriced, and all pamphlets and circulars, descriptive of engineering appliances, methods, work accomplished, etc., are preserved. The file here referred to is designed to cover engineering work in general, with sub-divisions separately covering the different branches of engineering work. The points considered in the classification are ease and rapidity of reference; and to this end each publication is placed under that heading which represents its nearest and most important relation to engineering work as a whole. Some exceptions must be made, however, as when the manufacture of the article governs the classification. For instance, a circular relating to Locomotives is classed under **Railway Engineering** (Rolling Stock), and not under any class of the division of Mechanical Engineering. On the other hand, the catalogue of a bridge company is put under **Civil Engineering** (Bridges and Buildings).

As the titles of many trade publications do not clearly indicate the matter of which a record is desired, it will save much time in filing,

and serve as a useful guide in a search, to arrange a paster-blank, to be attached to the outside cover. This may be arranged and filled out as follows:

TRADE CATALOGUE FILE

General Subject—Railway Engineering
Class—Rolling Stock
Sub-Class—Locomotives
Name of Company—Baldwin Locomotive
Works, Philadelphia

The names of the main heads and classes on these pasters must conform exactly with those adopted for the file. But the sub-class or article name should briefly and clearly state the article, or the most important of the articles, dealt with in the catalogue indexed. The sub-classes in the file here referred to, in many cases cover a wide range of articles; as **Boiler Auxiliaries**: Stokers; Feed Water Heaters, etc.; Boiler Fittings and Tools. But a catalogue of Feed Water Heaters should be marked under the sub-class on the paster—Feed Water Heaters. In other words, the paster should show at a glance what the catalogue deals with. After having been properly marked in this manner, each catalogue is filed in the proper compartment of the catalogue file. The classification adopted for this file is as follows:

CIVIL ENGINEERING

Instruments—Surveyors, Draftsmen.
Material—Steel, Brick, Cement, Asphalt.

Earth and Rock Work—Contractors' Machinery and Supplies, Traction Engines, Dredges, Steam Shovels, Pile Drivers.

Rockwork—Drills, Channelers, Tools, Explosives.

Road Construction—Road-making Machinery.

Concrete—Mixing Machinery, Concrete-steel Systems.

Hoisting and Conveying—Cranes, Blocks, Trolleys, Telfers, Hoists, Derricks, Cableways, Belt and Chain Conveyors, Coal-handling Machinery.

Bridges and Buildings—Complete Structures, Bridges, Tanks, Towers, Fireproofing in Buildings, Special Constructions, Fittings, Supplies.

RAILWAY ENGINEERING

Line Construction—Trackwork, Tools, Signals, Gates.

Rolling Stock—Locomotives, Cars, Car and Engine Fittings, Specialties.

Electric Railways—Cars, Fittings, Line-work.

Special—Industrial Railways, Automobiles.

MUNICIPAL ENGINEERING

Material and Supplies—Pipe, Valves, Cocks, etc.

Meters—Gas Meters, Water Meters.

Wells—Well-drilling Machinery.

Fire Protection—Fire Engines (only), all Apparatus (except Engines), Fire Alarms.

Care of Streets—Cleaning and Sprinkling Apparatus.

Disposal and Sanitation—Disposal Systems and Apparatus, Disinfecting Apparatus.

ELECTRICAL ENGINEERING

General—Serial or General Catalogues of Companies.

Machines—Generators, Motors, Transformers, Converters.

Instruments — Instruments, Controllers, Batteries.

Wiring and Linework—Wiring, Insulators, Supplies.

Special—Lamps, Fans, Heaters, Telegraph, Telephone.

MECHANICAL ENGINEERING.

Material—Iron and Steel Stock, Tubing, Screws, Chains, etc.

Fuels—Fuels, Gas Machines, Acetylene Apparatus.

Boilers—Boilers, Furnaces, Stacks.

Boiler Auxiliaries — Stokers, Feed-water Heaters, etc.; Fittings, Tools.

Steam Engines—Reciprocating, Turbine.

Engine Auxiliaries—Fittings, Packing, Valves, etc.

Gas Engines—Gas and Oil Engines, Fittings.

Gages and Meters—

Hand Tools—Machinists' Hand Tools.

Pneumatic Tools—

Shop Transmission—Belts, Shafting, etc.

Foundry and Forge—Apparatus and Supplies.

Air Compressors—

Air Blast—Blast Draft, Ventilation, Dry Kilns.

Pumps—Reciprocating Pumps.

Pumps and Rams—Centrifugal Pumps, Hydraulic Rams, Air-lifts, Pump Governors, etc.

Water Wheels—Turbines, Impulse Wheels, Fittings.

Machine Tools—Lathes, Planers, Drills, Millers, etc.; Hammers, Presses, etc.; Sheet and Wire Working.

Special Machines—Grinding, Wood-working, etc.; also Abrasives.

MINING AND METALLURGY

Mining and Metallurgy—(Except the following division).

Milling, Crushing and Pulverizing Machinery—

PAINTS, OILS, ETC.

Paints, Lubricators, Preservatives—

MISCELLANEOUS

Fence and Railing—

This index was devised to fit a number of limiting conditions of the establishment in which it is used, and should not be taken to represent an ideal classification. The general plan followed in the arrangement is, however, quite clearly apparent, and may be used with any degree of modification or elaboration.

Filing. The actual filing of trade publica-

tions presents greater difficulties than the system of classification. The latter may be made to suit any given conditions, but catalogues are of such a variety of sizes and shapes as to almost defy system. Some time ago "American Industries" published an article on "Standardization of Trade Catalogues" showing some of the advantages, from the printer's point of view, of standard sizes in trade catalogues.

Two of the sizes suggested are standard and economical. The smaller size, $3\frac{1}{4} \times 6$, is not a standard size, but is often used on account of the fact that it is easily mailed and can be enclosed in an ordinary business envelope, which will not conveniently take a $3\frac{1}{2}$ -inch width. The dimensions and shapes of the various sizes advocated are as follows:

Dimension of Binding Edge in inches.	Dimension of Top and Bottom Edges in inches.
$3\frac{1}{4}$	6
6	$3\frac{1}{4}$
6	9
9	6
9	12
12	9

The advantage of having all the catalogues needed for reference filed upright in compartments of these four sizes only is self-evident.

Two effective plans for filing are as follows:

File all booklets, catalogues and circulars alphabetically under the class of goods advertised. Then have a card index referring to the compartment containing the catalogue, and file

the card alphabetically under the name of the manufacturer. This plan is ideal, but is not possible at the present time. Manufacturers insist on getting out their literature in "any old size" that strikes their fancy, and also will put into a catalogue the description and size of every class of goods they manufacture or carry for sale, entirely ignoring the fact that the buyer, when interested, wants to see for comparison what each manufacturer has to offer in that particular line, and may not at all be interested in the entire product of any one plant. Some few manufacturers have learned this and are now carefully eliminating from each piece of advertising matter any reference to products other than the one definitely and specifically mentioned in that particular piece of advertising matter. Then again, these manufacturers are having all their literature in one uniform size, and frequently it is so produced that it can be put together by the customer in a loose-leaf binder if he desires to have all the matter from one house in one book. This method of issuing advertising literature enables the prospective customer to file the catalogues, booklets, and even circulars, in any way he deems wise, conforming to the above method.

Another method is to file the catalogues, booklets, etc., alphabetically under the name of the manufacturer, and have the card index

refer to the name of the manufacturer, but filed alphabetically under the class of goods advertised. This plan can be put into effect with any modern catalogue, it being only necessary to have standard sizes.

Variations in Sizes of Catalogues. Probably some of the blame for variation in size should be placed on the printer, who is often required to get up something new in style, and a "little out of the ordinary," something that will attract attention, the object of the manufacturer being to catch the eye of the prospective purchaser by the novel shape of the booklet and the attractive color scheme of the cover.

Another cause for the variation in size is the cost of mailing. A catalogue is planned for a certain number of pages, the paper is selected with the idea of mailing for a certain amount; paper usually has to be made specially for a large catalogue, and is consequently ordered while the work is in process. It is then found necessary to increase the number of pages, which would naturally increase the mailing cost. Sometimes the paper can be returned and a lighter weight obtained in its place, but usually it cannot without sacrificing a considerable portion of the cost. There is but one other way out, and that is to decrease the margins and make the books smaller by trimming, to save the extra postage, and consequently

another mongrel-sized catalogue that will not fit any file.

Most advertising literature is delayed in its preparation in order to get the latest possible information, and then it is desired to get it out before the buying public at the earliest possible moment; consequently there will often be annoying delays because the printers cannot get the paper and "rush the job." A scheme of standardization would to some extent at least, solve this problem. As soon as it became generally recognized that certain sizes of catalogues would be used to the exclusion of all other sizes, the dealer in paper would begin to carry in stock all of the sizes that are necessary to produce these dimensions, in the standard weights and qualities. At the present time it is impossible to do this, as the investment necessary would tend to make the paper business very unprofitable. This would also give the manufacturer who had to increase the number of pages in his catalogue, a chance, as he could readily dispose of his heavy paper and get a lighter weight instead, and that probably in stock, and thus avoid the delay of having it made at the mill.

The attractiveness of the proposed catalogue can be attained as effectively by the design of the cover as by using an unusual size. There is certainly enough latitude in color schemes, with or without bronzing and embossing, color

lithography, steel-plate work, and the thousand and one other ways in which novel and harmonious results can be obtained that are appropriate to the goods advertised, attractive to the hurried glance, and not offensive to the artistic taste. If the manufacturers would agree to use standard sizes only, the artists, engravers, and printers can effectively take care of the "pulling" properties of their literature.

The prevention of waste is a greater factor in the standardization scheme than any other financial reason. The attractive and carefully prepared catalogue is often thrown in the waste basket within a day or two after receipt, often because the recipient has no satisfactory way of filing it. The expense of filing would be greater than the value of the catalogue, and when it is needed for reference a request is made for another, and probably at some future time, for still another, until at least two and sometimes three or more catalogues are sent to the same party and for a purpose for which one would have answered. This matter is certainly of much more importance now than it has ever been in the past, as the tendency of the times is toward improvement in the quality of printed matter and it is necessary for each manufacturer to have his literature as good at least, as his competitor's, and this is resulting in the increase in expense per copy of each piece of literature sent out.

INDEXING BOOKS AND PERIODICALS

The index is the final text feature of a book. It is at best tedious work, but it is important. The by-gone writer who exclaimed: "H—I is not hot enough for the man who made a book without an index," may have been in advance of his age but his comment was particularly true of the maker of scientific, and most especially of reference, books. The need of an index being recognized, some effort is certainly warranted to make sure that the index which is provided performs successfully its proper function. Yet the engineer who frequently consults the literature of his profession is bound to be impressed with the unsatisfactory nature of the indexes with which many engineering books are provided. There must be a reason for this, so before taking up the method of actually making an index, it is worth while to consider what constitutes a good index and what are the causes of the faults in many existing indexes.

Some Rules to be Observed in Making Indexes. In a discussion on these questions some years ago in "Engineering News"* it was pointed out that most of the faults of indexing were due to lack of classification and of the selection of key words on the basis of the fundamental idea of the topic.

What constitutes a good index? The "Cen-

*Engineering News, April 28, 1898, and Aug. 20, 1903.

ture Dictionary'' definition given on page 300 is perhaps at fault in that it does not emphasize a little more the distinctive office of indicator or pointer-out, which the index to a book occupies. But neither the definition mentioned nor the more general one immediately following it expresses fully the exact nature of a good book index, in which nearly all topics are divided into sub-topics, and again into minor topics. In the best form of indexes only the key words of the main topics are arranged alphabetically with reference to the index as a whole, those of each sub-topic being arranged under its proper main topic in alphabetical sequence in respect to themselves alone. This subdivision of alphabetic lists may be extended to any degree which the nature of the topics makes desirable. In other words, the element of classification as well as that of alphabetic arrangement, enters into the selection of the key words, which with their proper modifying and qualifying words and page references, constitutes an index.

Keeping alphabetic arrangement and classification in mind, the first duty of an indexer having a number of topics, reference to which is desirable, is to select for each of these topics a key word which a person wishing to refer to that particular topic is most likely to think of and seek. This is evidently in many cases, purely a matter of judgment, and it is the diffi-

culty of judging exactly what word another person will think of in any particular case which makes necessary cross-indexing and cross-reference. By cross-indexing is meant the indexing of the same topic under two or more possible key words. Cross-referencing is a similar process but one of a somewhat different nature. Rather broadly defined, a cross-reference is a parenthetical expression following a key word which refers the reader to another key word where the topic is fully indexed, or where additional or closely allied information is to be found. Although the selection of key words is not a process which rules alone can direct, there are certain general rules governing this work which the indexer should strive to follow.

A modifying or qualifying word is seldom, if ever, suitable for a key word. Such words as 'assumed,' 'best,' 'character' and 'nature' belong to this class, and their uselessness as key words may be seen from a single illustration. Assume that the topic to be indexed is a discussion of the character of flange section for plate girders. Now, a person desiring to find this discussion would be no more likely to look under 'character' than he would to look under, say, 'composition' of flange section, 'make-up' of flange section, 'design' of flange section, either of which would express the topic indexed quite as accurately as 'char-

acter.' The preceding rule is a very elementary one, but it is violated with surprising frequency in book indexes.

The fundamental idea of a topic is not a criterion for the selection of the key word by which to index it. Instead, the thought should be first of the classification under which the word properly comes, and second, what position in this classification the topic occupies; that is, whether it belongs to the main topic or is a part of the sub-topic under a main topic. The reason for this is, of course, that **ideas** cannot be alphabeticized; only **words** are susceptible to this form of arrangement. Hence the position of any particular idea in an alphabetical list is determined by the sequence of words employed to express that idea; one arrangement of words may place it near the beginning of the alphabet, while another will place it toward the end, and the reader has nothing upon which to base his judgment as to where it will be found. If, however, we first classify the ideas to which we wish to make reference into main and sub-classes proceeding from the general to the particular, we finally limit the field in which the idea may be located so that it can be found easily and certainly.

To illustrate, assume that the topic to be indexed is: "assumed up-lift for swing-spans." The fundamental idea is uplift or end-uplift

and either might be selected as a key word if we adopt the rule that the fundamental idea of a topic is the criterion for the selection of the key word by which to index the topic. If 'uplift' is chosen, its alphabetic position is at one end of the index, and if 'end-uplift' is chosen, that position is near the beginning of the index. If, however, we consider the classification of the idea, we should place 'uplift' as a minor topic under the sub-topic 'swing-spans,' under the main topic 'draw-bridges.'

The question may now be asked, would a reader desiring to look up "assumed uplift of swing-spans" be likely to think of searching for it under 'draw-bridges?' There are reasons for thinking that he would. 'Uplift' in its special meaning here is peculiar to swing-spans alone, and as a reader would have swing-spans only in mind, and never fixed spans, lift spans, or bascule spans, when seeking information respecting 'uplift,' 'swing-spans' seems at least as desirable a key word as 'uplift.' The reason for placing swing-spans as a sub-topic under draw-bridges is that a swing-span is only one of several forms of draw-bridges. It might, however, be made a main topic itself and certainly would be were the book being indexed one treating on draw-bridges alone.

It may be accepted as a cardinal rule of good indexing that if a key word is used at

all, then every possible reference under that head should be included. The force of this rule will be appreciated if we assume that a person wishes to look up all that a book has to say on swing bridges. His natural course would be to look under 'swing-spans' in the index and consult every reference he found there. If 'uplift' were not included in these references, he would miss this important item altogether unless he ran upon it by chance in consulting some of the other topics referred to.

Undoubtedly 'uplift' is also a possible key word for this topic, and one which under certain circumstances might be thought of by a reader rather than 'swing-spans.' It is advisable, therefore, to cross-index the topic under 'uplift' unless it should happen to be divided into several sub-topics when the key word 'uplift' should be made merely a cross-reference to 'swing-spans,' under which would be found for the reasons stated a full detailed index of 'uplift,' and all its sub-topics. In such a use it will be seen that a cross-reference saves space by avoiding a lengthy repetition. Were there no sub-topics under 'uplift,' then cross-reference, instead of cross-indexing, would be a fault, because it would necessitate the reader making another search to find nothing additional but the page num-

tor of the New York State Library and president of the American Library Association. It was originally intended to assist librarians in the classification of books and pamphlets, but it also furnishes an effective system for classifying and indexing all kinds of literary material, including clippings, catalogues, reports, etc. It may be applied, in connection with a card index, to periodical literature, by making practical use of the various published indexes, its elasticity making it possible to effectively classify the most specialized articles.

EXPLANATION OF THE DEWEY SYSTEM.

The Dewey System is based on a division of the entire field of special knowledge into nine classes, numbered from 1 to 9, and a classification, 0, for matter of a general, non-specialized nature. This primary classification is:

0 General Works	5 Natural Science
1 Philosophy	6 Useful Arts
2 Religion	7 Fine Arts
3 Sociology	8 Literature
4 Philology	9 History

Each of these Classes is again divided into nine Divisions, with a tenth for general matter, and each Division is again divided into Sections. This decimal subdivision may be carried on to classify items with as much specialization as desired.

“Engineering” is classed as Division 2 in Class 6 (Useful Arts), the Divisions of which are as follows:

- 600 Useful Arts (General)
- 610 Medicine
- 620 ENGINEERING
- 630 Agriculture
- 640 Domestic Economy
- 650 Communication and Commerce
- 660 Chemical Technology
- 670 Manufactures
- 680 Mechanic Trades
- 690 Building

in which the first digit indicates the Class; the second, the Division, and the third, the Section. After the third digit, a decimal point is inserted and further subdivisions are indicated by digits following this; for example, 621.3, which represents Electrical Engineering.

The various Sections of Engineering (620) are classed as follows:

- 620 Engineering (General)
- 621 Mechanical
- 622 Mining
- 623 Military
- 624 Bridge and Roof
- 625 Road and Railroad
- 626 Canal
- 627 River and Harbor
- 628 Sanitary; Water-works
- 629 Other Branches

While this classification has some serious faults, and is not used in the classification of published indexes of the technical press, it is not difficult to make the adjustment. For instance, Roads are usually classified under Municipal Engineering, which also includes Sanitary and Water-works, while Railroads have an entirely separate classification, but in the Dewey System, Roads and Railroads are classed together, an arrangement which was satisfactory at the time the system was devised.

USES AND ADVANTAGES OF THE DECIMAL CLASSIFICATION.*

The decimal classification may be used to advantage in the indexing and filing of notes and memoranda, clippings, general information, articles in technical journals, drawings, catalogs, and books. For this purpose the decimal system possesses certain important advantages over the alphabetical system.

(1) It groups allied subjects. For example, suppose the alphabetical arrangement to be applied to a case of catalogs. The catalogs of the various machine tools, as planers, lathes, drills, hammers, etc., would be scattered throughout the case. With the decimal sys-

*From "An Extension of the Dewey Decimal System of Classification Applied to the Engineering Industries," by L. P. Breckenridge and G. A. Goode-nough. Bulletin No. 9, University of Illinois, Engineering Experiment Station, Published November, 1906.

tem, on the other hand, all these catalogs would be grouped together under the class number 621.9.

(2) Unless an elaborate system of cross-reference is used, the alphabetical scheme is ambiguous; in many cases there is doubt as to what letter should be given a subject. For example, take the item, "Automatic pneumatic block signals." This might almost equally well be indexed under A, P, B or S. With the decimal system this item has its one number, 656.256.4.

(3) The decimal system has the advantage of flexibility and an indefinite capacity for extension. For the indexing of books and catalogs only the main divisions and sections will, in general, be found necessary; but for card indexes of technical literature the most minute subdivisions must ordinarily be used. In individual cases, the user may find that still further division is required. An extension may then be made by adding another decimal place, and if still further subdivision is required still another digit may be used.

The average engineer, for example, can easily index all matter relating to traveling cranes under the same class number, 621.872. The designer or builder of cranes may, however, have so much matter relating to this special subject, that further subdivision is needed. By the addition of a digit, this matter

may be divided into nine groups designated by 621.872.1, 621.872.2, etc.; and, if necessary, each of these may be divided into nine new groups.

VARIATIONS AND MODIFICATIONS.

In the modern use of the system the main divisions and sections as published by Mr. Dewey have been retained unchanged. It cannot be denied that there are many glaring inconsistencies in the arrangement of engineering subjects. For example, no engineer of today would put Electrical Engineering as a division under Mechanical Engineering (621.3) co-ordinate with Blowing and Pumping Engines (621.6); nor would he relegate Concrete to an unimportant place under Building Materials. There is no doubt that a committee of competent engineers could vastly improve the logical arrangement of the class numbers for engineering subjects. However, the system as it is, with its faults, has been in use for several years and has become more or less universal. It is used in libraries and by many business concerns and individuals. It has become a sort of standard like the "Sellers" system of screw threads. For this reason alone, radical changes would be inadvisable. The inexperienced user will be likely to see room for improvement and will be tempted to make changes in the system for his individual use. Such changes can only

lead to confusion. It is far better to accept the system merely as an arbitrary set of numbers corresponding to certain topics and resolutely dismiss rigid ideas of logical sequence and consistency.

There are certain permissible modifications, however, which may be made without violating the integrity of the system. To avoid the writing of long numbers a single letter may be used for the first three of four digits. Thus an Electrical Engineer would naturally have most of his material under 621.3 (Electrical Engineering), and for this number he could substitute the single letter E. Likewise a railroad man might use R for 625 (Railroad Engineering).

Another modification consists in the use of an alphabetical arrangement for certain subsections combined with the decimal arrangement for main sections. This is sometimes useful in minute subdivisions. For example, under 621.728 (Material and Supplies for the Foundry), these various materials may be arranged in alphabetical order.

The use of form divisions is a modification that may often be employed to advantage. There are certain set forms that are used throughout the whole range of the Dewey classification. These are:

- 01 Philosophy or theory
 - 02 Compendes, text-books, etc.
 - 03 Cyclopedias, dictionaries, etc.
 - 04 Essays, addresses, etc.
 - 05 Periodicals
 - 06 Societies
 - 07 Education, teaching. Schools, colleges,
universities
 - 08 Tables, calculations. Miscellanies
 - 09 History. Progress and development.
- These forms may be further extended; thus:
- 064 Exhibits, etc. (under Societies)
 - 072 Laboratories (under Universities)

Other form divisions that apply particularly
to Engineering are the following:

- 001 Statistics
- 002 Quantities and costs
- 003 Contracts and specifications
- 004 Designs and drawings
- 005 Executive
- 006 Working and maintenance
- 007 Laws
- 008 Patents
- 009 Reports

These four divisions may be enclosed in parentheses and annexed directly to the usual class number. Thus, 62(07) indicates Engineering Education; 621.32(09), Progress in Electric Lighting; 621.57(008), Patents on Ice-making Machinery, etc. The object of this

parenthesis separation of the form division is convenience in cross-references. For example, if one is interested in Patents he may write his class numbers as follows:

(008)62 Patents—Engineering

(008)66 Patents—Chemical Technology

(008)69 Patents—Building

In this way all cards on Patents are grouped together.

Other modifications will suggest themselves to the user as he becomes more familiar with the system.

To index and file an item, it is marked with its classification number and placed in the numerical order thus indicated in the collection which it joins. To find an item, the subject index is consulted for the classification mark, which gives the numerical place in the collection of all the items the collection contains under the heading sought. The items under each head may be arranged alphabetically by authors or titles, and if the collection is large enough to require it, the items may be alphabetically indexed under each head, though generally the items themselves, properly arranged, furnish their own index.

XX

LITERARY CRITICISM

CRITICISM OF BOOKS BY READERS

Literary criticism is an art in itself; it is a branch of literature as clearly defined as that of the creation of the work criticised, and in many cases more so. A book of fiction is distinctly a creative work and its critic is supposed to possess an extensive knowledge of existing literature and of the rules of literary composition, a trained taste in selecting models, and a quick imagination capable of perceiving comparisons and of setting forth vivid impressions. On the other hand, a technical work is as a rule, a compilation and sifting of the existing literature on a specific subject, and a thorough and intelligent criticism can be written only by one who possesses a practical knowledge of the subject and an acquaintance at least with the principal literature pertaining to it. In the cases of individual reviewers, one or both of these requirements are frequently missing. Partly for this reason, "Engineering News," in an editorial a few years ago, made a plea for similar team work in the criticism of books as in their writing.

It has already been said that any scientific book is rarely the work of a single man; this is even more rare in the case of engineering books. A book dealing with any branch or ramification of engineering work must be in the main a summary of the experiences and views of a great number of men. The more completely it represents those views and experiences, the greater is the value of the book, and the more truly is it a "storehouse of knowledge," a source of instruction for the young, and a manual of reference for the old engineer.

The mere writing of a book is, of course, usually the task of one man. But the actual writer's share in the production of the book is only that of collecting, averaging, and arranging the opinions and results of those who have labored in the field of which it treats. In addition, it is also his province and duty to forecast, from the results of their compilation, the development of the immediate future. If in this work he is able to point the way to improvement, indicating, for example, how the results of the calculator and the work of the builder may be harmonized, he will have produced a book of maximum value. In appreciating this, however, it must not be forgotten that the writer of the book is only one of its many authors.

Books of engineering, like all other things, are more or less imperfect, approaching perfec-

tion as a finite variable approaches its limit. As a matter of experience, errors may, and do exist in books not only after the most careful proof-reading, but after revision and re-revision. Such errors may be mistakes of facts, or mistakes of opinion; they may even be mere errors of omission, there being no untruth or inaccuracy in the statements actually made. Whatever the nature of the errors, they will yet to some extent affect the precision of the teaching of the book, and for that reason should be discovered and corrected.

The correction of the errors or inaccuracies of engineering books is of much importance. Contemporary and succeeding generations may be misled by them if they are passed by and are allowed to stand in successive editions of a work. Usually, the writer of a book is sufficiently interested in his work to be continually on the look-out for errors, so that many or most of them are corrected in a second edition; though examples are not wanting where gross mistakes have stood uncorrected through edition after edition. In any case, however, it is but natural to expect that not all the errors will be corrected through his efforts alone, especially such errors as may involve his personal opinion or point of view. What is required to more rapidly and more completely locate the errors in any engineering book is the co-operation of all its authors. A more

general and more conscientious criticism of books by their readers is necessary.

This subject deserves closer attention than is accorded to it by the majority of engineers. It is not customary among them to criticise publicly the books that are published for their use; that is left for the reviewers of books, the technical periodicals to whom the books are sent for this purpose. No doubt every engineer who reads a work dealing with his special field makes definite mental criticism of all passages which seem incorrect or otherwise to merit his disapproval. Many make a practice of noting down all such criticisms, together with the corrections which seem suitable, either in the margin adjoining the passages in question or on separate correction slips. This is no doubt an excellent practice, but few engineers realize the importance of the matter sufficiently to make known their criticisms, bringing them to the attention of either the author, or their professional colleagues.

The writer of the editorial on which this chapter is based states that the criticism of technical books should be considered as a duty that the engineer owes to his profession, and therefore also to himself. Certainly whatever tends to increase the value of technical books by decreasing the errors which they contain works to the advantage of the individual engineer, who depends upon them for the largest

part of his information. As has been indicated above, every engineer, broadly speaking, has a share in the authorship of all books in his special field of work which are published or revised during his engineering life; and if his views are misrepresented in any one of these books, or statements appear which he believes to be untrue, it is manifestly proper for him to record his disapproval or state his correction in such a manner that it may become known to others. The importance of this will be more apparent when it is reflected that a large part of engineering literature represents (or is intended to represent) an average of opinion or an average of current practice in regard to various matters of design or execution. It is not always easy for a single writer to determine such an average with accuracy; and where it is inaccurately determined or stated, the public criticism of many different engineers is the best, if not the only, way to fix the true average and thus to lead to the correction of the error.

The amount and kind of criticism possible in book reviews of technical periodicals is quite limited. Not only is the reviewer's perusal of a book far different from the thorough study given to it by its purchaser and user, but it is also true that the reviewer, however capable, is but one, while the users of the book are many; and not every minor book can be re-

viewed by a specialist. It must be appreciated, too, that the primary function of the book review is a general weighing and valuing of the book and outlining of its scope and content. Criticism of details can take, therefore, only a subordinate place in the book review.

What has been said relates almost wholly to errors of omission and commission. It may be added that true and broader criticism includes approval as well as disapproval and that it is most useful when it is constructive rather than destructive and kindly rather than harsh and overbearing. Different persons will require different service from a given book. Some persons will want only those portions of the book that cannot be found elsewhere in engineering literature, and will consider the other portions useless repetition. Others will require fairly full explanations of everything connected with the subject, and will appreciate the addition of a set of instructions for using the slide-rule or logarithms. Between these two extremes there is a wide range of opinion.

This brings up the question, which is worth considering in this connection; for what class of readers technical books should be and actually are written. Many books, in fact, too many, are written expressly for students in engineering colleges, a common fault with a book of this kind being that the style and method of treatment are such that the book requires

to be digested in the class-room and supplemented with explanations and illustrative lectures. In some cases, the simpler portions are given in full elaboration, while the really important and difficult portions are treated synoptically, to be elucidated in the class-room. In other cases, the difficult parts alone are given, while all preliminary explanation and definition are left out, being assumed to be supplied by the students' previous study, or possibly intended to be given in lectures with experimental demonstration. In whichever way the book is unbalanced, it loses its value as a study text for the general reader. It would seem that every technical book should be so logical, clear, and complete, in treatment and language, that anyone possessing a reasonable amount of general knowledge can read the book understandingly without excessive difficulty.

On page 89 was mentioned the necessity of clearness and accuracy in statements made in textbooks, but in spite of that evident necessity, there are many examples of needlessly involved statements or explanations found in books written primarily for engineering students, such as the following in a certain electrical book:

"The dynamic character of electromagnetic action is so much in accord with common mechanical experience that the electromagnetic actions have been chosen to form the basis for the definition of a system of absolute electrical units."

which sentence means rather less than nothing.

Speaking more generally, it may be claimed that books should in most cases be written primarily not for the student, but for the practicing engineer. When such a book is then used as a class-room text it may be cut down or supplemented as an individual teacher may desire. Some engineers have even gone so far as to say that when there is no need of a book on a given engineering subject except for class-room study for the use of college instruction, then there is no excuse for its existence.

The question of what should be included in a book dealing with a given subject, and what omitted, admits of radical differences of opinion, even after it is decided what class of readers the book is intended to serve and what amount of preliminary knowledge it should presuppose. A book on any particular branch of engineering should cover the full extent of that branch, in greater or less detail of statement according as it is intended to reach a better or less well-prepared circle of readers. The range of the subject should be clearly defined; its practical extent should be indicated and the more purely theoretical ramifications placed in proper relative position.

All portions of the subject should be treated in equal detail; i. e., the book should be balanced, except as this may be modified by the demands of practice. On the other hand, the

line should be drawn sharply at matters that do not belong to the special subject under discussion. A book on elevated railway construction should not discuss the proper way to prepare concrete. A work on the design of electrical machinery should not tell how to mold in green-sand, though it may discuss the quality of cast iron in relation to magnetic properties. If definite limits of this kind are not fixed, a book might be expanded to almost any degree, and it is not always easy for an author to recognize these limits; a professor's book is apt to be sketchy, a practitioner's apt to be too much detailed. Opinions on what should be included in a book may differ widely, often with equal plausibility in favor of each side. Fifteen different engineers, if asked to outline a book on a given subject, might present fifteen radically different schedules of contents. And it might be that if fifteen books were written to suit closely these opinions, a review would have to be highly appreciative in each case and yet that fourteen of the engineers in question would severely criticise and condemn as unsatisfactory the book written to the specification of the fifteenth.

THE BOOK REVIEW

Upon publication of a book, a number of copies are set aside for "review copies." These are sent to periodicals whose readers are apt to be interested in such a book. The publisher

might send the periodical merely an announcement of publication, which might be printed as an item of news, but he wants to find out for himself and for the benefit of others, what the experts think of it, so he sends a copy of the book itself, usually with a formal request for a review notice. The sending of a book to a periodical is primarily an announcement by the publisher that such a book is available, and a review of it in the periodical is supposed to be an expression of expert opinion regarding it. Such a notice also has a certain advertising value, and the publisher counts on this. There was a time when the "book review" was considered for nothing more or less than this advertising value; when it was merely a "write-up," without criticism or expression of expert opinion, for which the periodical got the book in payment, and sometimes an advertising order by way of inducement for a good notice. This general abuse of the book review does not exist today, but book publishers do still receive many requests from the smaller periodicals for books (especially expensive books) for "review purposes" with the promise of a good notice. There may be still some periodicals which turn to their personal advantage their privilege of reviewing books, but while these must be few in number, it is a fact that there are very few periodicals that review technical books in a fair and intelligent manner. The "Book Review Digest"—the guide for libra-

rians, published in Minneapolis—has selected only four out of the great number of engineering periodicals from which to quote review notices.

As a rule, the result of reading a review of a technical book is unsatisfactory, the dissatisfaction increasing with the number of reviews read. But however the book review may be considered, it is a recognized and useful feature of our literature. It forms one of the best means available to the engineer for the judgment of books. It is an important feature of technical news and every buyer and reader of technical books should know how to read it and understand it—not merely the printed words, but also “between the lines.”

Every review has a certain interest and value to the busy reader, which value increases just in proportion as the reviewer dissociates the book from commercialism and considers it as a more or less efficient working tool of the engineer. A review written with only the possible advertising value to the publisher in mind, is of little value to anyone. The “ideal” book review is a disinterested analysis and appraisal of the value of a book, judged by the standard of its usefulness to the class of readers for which the book is intended. Its object is to convey to such readers information that will permit them to judge of the value

of the book without their personal examination. But does the average book review do this?

In the first place, the author and the publisher have no title to personal consideration in the review other than mere politeness would dictate; no more than the makers of the different materials entering into the construction of a building have in a published description of the building itself. It is, however, legitimate, and in fact, desirable, to tell something about the author; to make clear who he is and that he has a right to talk on the subject; to show his point of view, whether practical, theoretical, or as a constructor, designer, teacher, or whatever else he may be.

The qualifications of the reviewer are of primary importance. He should be a recognized authority on the subject under review; a man of judicial temperament, and possessing the faculty of being able to examine the book from the point of view of the many readers interested in the subject. A distinction should be made between a "reviewer" and a "critic." The so-called "literary critic" has no legitimate place in technical literature. Modern "criticism" is very much of a factory process and the "critic" too often assumes the qualifications of a man of letters and the judgment of a Solomon, to which he is by no means entitled. The reviewer of a technical book is not necessarily a critic—he is an appraiser.

The "ideal" reviewer would be a man of infinitely greater knowledge than the author, but as few men rush into print on technical subjects unless they know more about the subject than many other men, and in some cases more than any other man, this ideal reviewer is not easily available. The next best man is one with a judicial mind, and a good knowledge of what has already been published on the subject. If he has in addition a wide personal knowledge of the subject, so much the better, provided he does not permit his personal fads to influence his reading or to warp his judgment. For this reason, the duties and opportunities of a member of the editorial staff of a technical journal or of a professor in a technical college may fit him to produce a more valuable review than an engineer of national reputation; and this will partly explain why, in so many signed reviews, are seen the names of college professors. The engineer's opinions may be of the utmost value, but they should be themselves embodied in a treatise rather than in a review.

The essential components of a technical book are: Contents, Preface, Text, and Index. It may, or may not, be illustrated, according as illustration is required to give the reader a concise and clear understanding of the text; it may be any one of a variety of shapes and sizes, and may be bound in any one of a variety

of styles. In an "ideal" review all these features should have consideration.

The review itself should be headed by the publisher's announcement of Title, Author, Binding, Size, Number of Pages and Illustrations, Publisher's Name and Address, and Price of the book. These are facts of first interest, and convey to the reader a mental picture of the book, and present a brief preliminary outline of the reviewer's task. After the publisher's announcement, a note of the general scope of the book may be in order. This might actually be a summary of the Preface, or the Introduction, with the addition of other information of the same character obtained from the body of the book. But if, as is sometimes done, the author has made use of the Preface for making too broad statements of the qualities of his book and of himself, the conscientious reviewer will ignore these expressions of self-esteem and look on the Preface merely as an indication of the intention of the author, which should have due consideration in his appraisal.

Next in order would come an outline of the book, possibly based on the "Table of Contents," and dealing with the general division of the subject into parts, and possibly descend to the subdivision into chapters, or at least, into groups of chapters. It should show clearly the scope of the work and should indicate the

amount of space devoted to each phase of the subject. In this connection, the extent to which logical arrangement has been secured may well be discussed.

The reviewer may then enter into the details of his appraisal of the book, to such an extent as may be warranted by the importance of the work and the subject to which it relates, or as available space in the periodical may admit. A complete review would note especially the new things, comment on the author's treatment of the old by comparison with that of others, would notice errors, and possibly comment on the treatment of disputed points. Comments on the completeness of the treatment and the poor proportionment, and the noting of errors and omissions, call for a knowledge of other works and for good judgment. Such comments should be specific and should be clearly shown to be opinions that may be accepted or rejected by the reader at his discretion, but they should plainly indicate that the reviewer has read the book, and not merely glanced over the Preface and Contents and a few of the text pages. By such a reading, some statement is likely to be picked out and commented upon, while a qualifying statement is entirely overlooked, and a wrong impression is thereby given that might have been avoided if the whole section had been carefully read. It reminds one of the negro preacher who at-

tempted to prove that the Lord was opposed to the women's head-dress of today by preaching a sermon on the text "Top knot come down," taken from the sentence: "Let him who is on the house-top not come down."

It is often advisable to place the book in its relation to other literature on the subject, but this should not be taken as an opportunity to present the reviewer's pet theories. Too many reviewers pick out some weak point or some matter with which they are well acquainted and convert the greater part of the review into a technical or mathematical presentation of their views. Or they select a number of minor points in which their practice would be unlike that of the authors, and explain at considerable length how they would do it. Such reviews usually conclude with a general condemnation of the book, or in the warm glow of having had their say, wind up with the formula: "In general, the book is well written, shows the author to have an extensive knowledge of the subject, and should be on the desk of every engineer, etc., etc."

To all readers it is important to know if the book contains later material than a book of last year; if it treats the subject, or the several parts of the main subject, more or less thoroughly than a certain other book; if it is more practical, mathematical, theoretical, statistical, or general, and whether it is for

use as a text-book or for reference only. The reviewer can do good service to the reader in this if he is capable.

An important part of the review is an estimation of the value of the Index, and this may also be said, but to a less degree, of the Contents. Engineering treatises are not bought, like novels, to be read and cast aside. Many of them are never read through. Their greatest value is for reference and they should be written and published with that point in view. Every such book should have an intelligently made and comprehensive index; the book is incomplete without it, and imperfect if it is not well made. On this feature, the reviewer, if competent, may make some criticisms. The feature of illustrations is also open to criticism, as there is often too much carelessness displayed in preparing illustrations for technical books.

Finally, the work of the publisher, such as the binding, press-work, and other mechanical features, must be considered, and here also the review may be carried to the point of criticism. Books of fiction may often be selected from the cover design and their fancy typography, but engineering books cannot be judged in that way, any more than the value of a painting may be judged from the amount of gilt on its frame.

It must be understood that this outline of a useful review applies to books of real worth. The ideal review for an inefficient or harmful

book, is silence. Mediocre books are best handled by a few general statements as to treatment, contents, etc., and mention of their few good points. The fewness of the good features mentioned by the reviewer will speak as loudly as a detailed list of errors and omissions. Valuable books that appeal to a very small public are often treated in the same way as worthless or mediocre productions, because a periodical cannot afford to devote undue attention to affairs that interest a small reading public only, unless the extraordinary merit of the work compels attention as a matter of general scientific progress. This is unfortunate for both reader and author, but it must be so.

As to the review itself, it should be readable. A dry-as-dust review, although full of real information and praise, would injure any book. Then also, the reader would like to know who is responsible for the review. He has placed his opinions on record, and is open to a reply from the author, which may possibly result in an unseemly controversy. The reviewer who permits himself to pat the author on the back, to savagely criticise, to act with partiality to the publisher, or to confuse the issue by expounding his own theories, causes his readers to waste valuable time and money, or prevents the spreading of useful information. Fortunately, the signed review seems to be gaining in favor, and though it requires

more courage to write over one's signature than anonymously, it gives more weight to the opinions expressed.

The reader who is attracted by the title or subject of a book, approaches the review with the question in mind, "If I purchase and read this book, will my time and money have been expended to the best advantage?" And in so far as the review answers that question to the satisfaction of all who are likely to use the book, that review is ideal. But "ideal" book reviews are rare and only occasionally shine out among a far greater number of "notices" that convey to the reader nothing but meaningless platitudes. A good book is an asset, a paying investment, a silent partner, working constantly in the interests of its readers; an unreliable book is a menace, a source of danger, leading its trusting reader into untold trouble, that may result in possible disaster and a ruined reputation. The "Book Review" is subject to much manipulation and can easily damage a worthy book or crown the most unreliable work with a halo of Pecksniffian virtue.

XXI

THE ENGINEER'S LIBRARY

Libraries are of two general kinds: public and private. Public libraries vary in character according to the public they are intended for; private libraries—which include such special libraries as those maintained by various industrial and financial corporations for their own use—vary according to the special business interests and the idiosyncrasies of their owners, for the engineer, just as any other man, may have his literary preferences, prejudices, and hobbies. The present purpose is not, however, to treat of such specialties, but of the library in general as one of the tools of the engineer's workshop.

The importance of a library is, as a rule, little appreciated by the engineering student. To him, his books and periodicals merely introduce new thoughts which it is the duty of his instructors to make clear. Too often the graduate of a technical college goes out into the world with the idea that he is an engineer of experience and instead of making provision for the continuance of his studies and taking a just pride in the formation of a working library, he even sells his text-books

and throws away his periodicals as soon as he has passed his final examinations and received his diploma. What would he think of the brains of an engineer who, finding that his train was moving at sixty miles an hour, shut off steam and trusted to the train to keep on moving to the end of the line? The only direction in which it will go without motive power is down hill—and at the bottom it will stop. It is as true of study. The student who stops the study of his professional literature on his graduation loses momentum and will soon find himself occupying an inferior position. His roll of parchment and degree signify nothing more than a guarantee of a certain amount of training, which has brought him to the point where he must face the real problems of life without the guiding hand of his instructors; when he must depend upon his own resources and the use he makes of the literature of his profession.

The successful engineer, on the other hand, uses this literature as a practical working tool. He forms as extensive a library as circumstances will permit, not on the old idea of an accumulation of books to be looked at when wanted, but on the modern idea of an educational institution, where he can carry on his studies on any subject desired. As Carlyle said, "the true university of these days

is a collection of books;" from this school the engineer never graduates.

Extent of the Engineer's Library. A good library is like a cyclopedia—not a mere aggregation of pages to be read through, but a vast repository of learning for continual use and reference. But what should a good library for the engineer contain? The time was when a well-thumbed copy of 'Trautwine' and a note-book for memoranda of experiences and observations, constituted a satisfactory library for the average engineer. In those days the scarcity of technical books and the limited extent of engineering practice rendered such a compendium of practical information necessary, and at the same time, sufficient for all needs. Since that time, the great development of engineering work, the daily increasing mass of professional literature, and the wide dissemination of engineering knowledge through many educational institutions have altered the conditions and made necessary, and have also provided for, a wider range of reading. Mr. Charles W. Baker, in addressing the students of the University of Michigan, thus illustrated the extent of information required for the successful practice of any one branch of engineering:

Take, for example, that branch of engineering known as Water Power Development. We do not have to go back more than forty years to reach the time when

the old 'millwrights' were the men who actually did all the work that was done in this country in the development of water-power. All the knowledge they needed was carried under their hats, with perhaps some few rules copied in a private note-book. To-day, however, an engineer who conducts a water-power development enterprise must, either directly or through assistants, be familiar with the latest practice in stream gaging, dam construction, hydraulic motors and regulators, electric generation, transmission and utilization, and power-house construction, to say nothing of such matters as the relation between engineers and contractors, executive methods, dealings with labor organizations, franchises and riparian rights. It may be well, also, for him to know how to handle a board of directors and float a bond issue.

Perhaps you may object that no one engineer can do all this, but the fact is that engineers, in the aggregate, are doing all these things; and that every successful engineer to-day finds himself constantly in need of knowledge that he cannot carry in his head and for which he must rely on the experience of others, as recorded in his professional literature.

From this it would seem that the average engineer has need for a wide variety of information, implying an extensive range of study. It is not necessary, however, that he cover all these subjects in his own library. The nature and extent of his personal library should be considered in connection with the

accessibility of public libraries containing the class of literature he may have occasional need for. No matter how extensive may be his own literary resources, every engineer has frequent need for study outside the ordinary line of his work and the scope of his library. He is forced to resort to the public library, where he usually finds that the insatiable demand for popular fiction makes such a drain upon the funds of the institution that there are few technical books on its shelves and that these few are poorly classified and hard to locate. It is a lamentable fact that outside of the collections of a few technical societies and colleges the attention paid by libraries to scientific books is far below that required by their importance, and only in three or four instances has sufficient attention been given to them to make this department really useful to engineers.

In some of the larger cities, especially in New York, where libraries of all kinds are easily accessible, the engineer need possess only books of his active specialty, and a good collection of works of reference, but in the country and in small towns, far away from libraries containing technical books, a rather extensive and well-selected collection of standard works is necessary. Both the city and the country engineer would naturally require certain standard works of the profession and

some of the best treatises on their specialties; they would require also the leading periodicals devoted to certain phases of engineering work, and the published transactions of such societies as they may be members of.

Then, also, some engineers have need for what might be called 'traveling libraries,' in which everything necessary on a certain trip could be carried in a comparatively small space. With a good 'pocket-book,' together with some convenient system of filing miscellaneous information, such as explained on page 307, the traveling engineer can equip himself with a vast collection of information in very compact, portable, and accessible form.

In the formation of his library, the great mass of current literature offers the engineer a difficult problem. As already indicated, he needs a wide range of information. Specialization in reading does not solve the problem. There are no tight lines drawn between the various engineering specialties, but on the contrary, they overlap in all directions; no branch of engineering can stand alone; results of value are obtained by team-work, co-operation, and co-ordination. In a general way it may be said that only the young engineer attempts to specialize within very narrow limits, and that the older he grows in years and professional experience, the more he realizes the interdependence of the various branches of en-

gineering. With this realization comes an extension of his reading and the necessary limits of his library. A workman in a Portland cement works, for instance, may confine his study to cement manufacture and still possess all the knowledge necessary for good work, but the engineer of the works, who is interested in the use of cement in bridges, buildings, dams, etc.; in mining and quarrying, in steam-shovels, kilns, hoisting and conveying machinery, and in the conveying of materials, needs something more than the literature of Portland cement manufacture. "The most effective specialist is the man who keeps in good contact with the world at many points at the same time that he brings great pressure to bear on his one specialty."*

Another reason why an engineer cannot make his reading of too limited a scope lies in the fact that in all construction work the engineer is constantly working himself out of a job, and every change presents new problems for solution. It will be readily understood, therefore, why the question of a too voluminous engineering literature cannot be disposed of simply by saying that each engineer shall read the literature of his own special branch. If he is wise and ambitious, he will read that and much more.

*Prof. John F. Hayford in paper before S. P. E. E., on "Why Not Teach About Men?" Ithaca, 1906.

'Engineering literature' as a general term, includes such material as periodicals, books, trade publications, pamphlets, bulletins and proceedings issued by the Government, by learned societies and by individuals. Each of these classes has a certain value to the engineer, but it is with books and periodicals that he is brought into closest contact. In the selection of this literature, he meets many difficulties and disappointments, which can, to a certain extent, be overcome by a brief study of the general subject.

This study includes, in the case of books, a consideration of the vast quantity and the many varieties from which the engineer has to select those most suited to his needs, and the means of selection open to him; also some consideration of the book itself, its make-up and character; the author, the publisher, and the opinions of others regarding it. Some of these features have been treated elsewhere; here quantity, variety, and selection of books will be discussed. The subject of periodicals is quite different. It reduces itself essentially to a question of what kind of literature the engineer will read that his time and money may be expended to the best advantage and what periodicals will give him the greatest amount of such useful information.

When one considers the vast quantities of technical books and periodicals that are issued

annually, not to mention the thousands of other publications, and further considers that this flood of literature is the production of America alone and that England, France, and Germany are also producing such literature in greater or less quantities, it will be realized how distinctly modern was the comment of the wise man of twenty centuries ago when he said: "Of the making of many books there is no end." The most industrious reader of to-day could read but a very small proportion of the printed matter on any live engineering subject; he must face the difficult problem of digging out of it those things that are most necessary to his success, and in this there is a wide range of choice open to him.

Some technical books are good literature but poor engineering practice; others are good practice but very poor literature. As already said, the greater number of them consist of compilations of material from various sources. The original records of experiments and descriptions of works are usually found in the columns of the technical periodicals and the proceedings of engineering societies. The periodical publication tends to reflect the practice of the immediate past, the work of the present, and plans for the future. Time alone can prove the truth of these theories and the value of this practice. When that time comes, and the subject has become one of live inter-

est, and the accumulation of material has become more or less voluminous, some one undertakes to compile and classify it and re-write it for publication in book form. Thus, the book may be said to be a permanent record of approved practice, reflecting the operations of the past, from a year to ten years or more.

The many varieties of books are due to the varied experience, knowledge, and judgment of their authors; to their ability or inability as writers; and to their objects in writing the books—whether the aim is to fill a gap in the existing literature of the subject or merely to produce a commercial article for the sake of the royalties resulting from its sale.

One variety, unfortunately too common to-day, is the compilation of descriptive matter from trade catalogues or other sources, re-hashed into fairly readable style by writers who know little or nothing about their subjects. The opposite variety, which may be classed as the average good book, is the smoothly-reading and well-balanced treatise, prepared by a writer of literary ability and practical experience, from material compiled from reliable sources and with good judgment of its technical value. Neither of these books, however, really adds anything to our store of knowledge, but while the 'hack' book is, as a rule, unreliable and thoroughly useless, from

the engineer's point of view, the other presents the best of the available knowledge of the subject in easily accessible form and should be a valuable and welcome addition to his library.

Technical books are usually written for one of two classes of readers—practitioners, in which class may be included the mechanic and the engineering tradesman, and students. They might be designated respectively 'Treatises' and 'Text-books,' the former treating the subjects more exhaustively and technically than the latter. Whether engineering books should be written primarily for the student or the practitioner has been discussed on page 345.

A class of books which deserves special consideration is the valuable reference, or 'hand' or 'pocket' books. In this age of reference books it may be taken as a general principle that as knowledge of any engineering subject increases, and the literature of that subject becomes too voluminous and unwieldy, there are sure to be forthcoming those who will reduce the facts to the form of general treatises, and when, in turn, these become too numerous, their contents will again be sifted and condensed to the handy form of a 'pocket-book.' The best of these books are the results of years of patient and laborious study, compilation, and selection of facts, by men combining exceptional literary ability with education and

wide practical experience. They, with a few of the standard treatises, may be called the 'classics' of the engineering profession; they are few in comparison with the other varieties of books and a representative selection covering the principal fields of engineering should be found in every library.

There are other kinds of books—some advocate the personal fads of their authors; some are padded with useless words and illustrations, while others have a scarcity of facts; some assume too high a plane of importance for their subjects, while others are too modest; some describe obsolete appliances and by-gone practice, while others are too advanced in their statements.

One of the most important points to be considered in connection with technical books is the fact that they go out of date quickly, and an out-of-date technical book is of little more interest or enlightening value than the proverbial "candle under a bushel." In no field of modern endeavor has progress been so rapid as in that of engineering, and the constant production of new books is necessary to keep pace with this development. For instance, on the subject of 'Roads and Pavements,' which are so much a part of our every-day life that we almost cease to regard them as engineering problems, the writer compiled a Bibliography*

*Published as an Appendix on "The Art of Road-making."

containing nearly 500 book titles, and including only names of books of historic or practical value, omitting all trade publications and a vast number of pamphlets of merely local or passing interest. The list covers the period from about 1600 to date, divided into three sections: Previous to 1800 (200 years) containing 65 titles; 1800 to 1900 (100 years) containing 250 titles; and 1900 to 1910, containing about 150 titles. And the literature of this subject is not nearly as voluminous as that of some others.

Now, what is the cause of this great production of books on the comparatively simple subject of 'Roadmaking'? Mainly progress. The first book listed in this Bibliography is one entitled "The Duties of Constables and Surveyors of Highways," published in 1583. This was for a long time the only book on highways and ran through seven editions in twenty-five years. Highways in those days were merely routes, with no attempt at maintenance. In 1610, an enterprising citizen recognized this, and wrote a book called "A Profitable Work Concerning the Mending of Highways," which made people think, and caused the production of several books setting forth various methods of making highway repairs.

Then Tresauguet, in France, devised a new system of road construction, which was later improved upon by Macadam, Telford, and Met-

calf, in England, who made road-making a science and brought it within the scope of engineering. In their day, stones were broken and distributed by hand, and rollers, when used at all, were drawn by horses; to-day, we have the stone crusher, the steam roller, road graders, and other mechanical devices for road construction, as well as a large variety of road-making materials. A few years ago streets were 'cleaned' by rain and wind; to-day, street-cleaning is a science calling for a great variety of mechanical appliances and presenting many engineering problems. Until quite recently roads were built to accommodate ordinary horse and foot traffic only; now they must be built to withstand the damaging effects of the automobile and our comfort demands that they shall be dustless. All this development called for new, and more and more specialized, literature.

As in road-making, so in every other field of activity—every advance in civilization demands progress in engineering science and the wheels of progress are always in mesh with those of the printing press. With each advance, many books become antiquated, and new treatises are constantly required. The best of these may run through several editions, and remain standard for some years, but the 'revised and enlarged' editions of even the most reliable and comprehensive treatise must

eventually give place to the entirely new book, written with the more modern conditions as a basis.

Pages could be quoted from many technical books published during the past ten years or less, to show of how little value much of this literature is to-day, and the uselessness of the books of yesterday. But it may well be argued that no technical book can be kept strictly up to date. In fact, so rapid is the development of modern engineering achievement that with nearly every book published an addition or revision is called for in the interval between proof-reading and binding. The more ambitious the book, the more likely is it that this will be applicable. The telegraph and the daily paper combine to present a vast mass of new technical information to a large and ever-increasing audience, but for the most part such information is in so crude a form as to be misleading, and, to all except a few relatively well-trained men, of little or no lasting benefit until it has been digested and after that correlated with existing digested information. Besides the crudity of the news of the day, much that is essential to the engineer is never discovered by the reports and special correspondents and would not be adequately described if it were. This is especially true of a few of the most modern subjects, such as Aerial Navigation, Wireless Communication, and Radio-

activity, some treatises on these subjects having become obsolete in many of their statements before they are off the press. It is the function of the technical journal to gather up, sift, weigh, digest, and, as far as possible, correlate these new ideas, discoveries, and experiences with the information already collected and classified. By doing this, a well-edited weekly technical journal can to a large extent, combine the more solid news features of a daily with the accuracy and mature consideration of a monthly, or even of a really good encyclopedia, and it is by such means and by such alone, that it is possible for anyone to keep pace with modern achievements.

Methods of Selection of Books. From this, it will be realized how difficult is the problem of the selection of technical books. The difficulty is minimized when the buyer can examine the books and form his own judgment, but it is more often the case that the buyer is not so located that he can examine the books before purchasing. A few engineers and some of the large engineering companies purchase every book published touching the lines of work in which they are actively interested, good and bad alike, but the prices of technical books prohibit this wholesale purchase by the average engineer or contractor. He aims to form as comprehensive a library as his limited means will allow, of the most reliable and use-

ful books on his specialties, and must look elsewhere for the balance.

As to the means of selection open to the engineer, when he cannot see the books he usually buys from the advertised descriptions; or upon the advice of the publisher or the dealer, or from the review notices published in the various technical journals. Of these means of selection, the advice of the dealer should be placed foremost, provided, that the dealer has had some experience with this class of books and that his advice can be relied upon. The average local dealer, however, has only a vague general knowledge of technical books. He also sells fiction, general science, and miscellaneous books, as well as drugs, fancy goods, and stationery, and from the limited extent of his trade in technical books, he cannot, as a rule, command the special knowledge that is necessary to give the best advice. The advice of the publisher is always worthy of consideration, but it should be remembered that most publishers are chiefly concerned in the sale of their own publications, and that some, in fact, do not sell the publications of other houses at all. It is well, therefore, to take the advice of either the publisher or the dealer only in conjunction with the buyer's own judgment formed from the periodical reviews of the book.

The catalogues and advertisements of the

publishers are the most available and common means of selection. There are, of course, various kinds of publishers, from the factory that turns out 'hack' literature, to the one whose name is a guarantee of authority, but even the high-class publisher may occasionally make an error, and through a mistaken judgment, issue a book that later proves unreliable. Such a book, based on wrong theories, or containing misleading facts, formulas, or tables, is a source of danger, especially in the hands of an inexperienced man, and may lead to most serious results. It also brings considerable financial loss to the publisher.

Occasionally pamphlets are issued containing 'Lists of Recommended Books,' but much depends on who made the lists and for what purpose they were made. The list issued several years ago by the Society for the Promotion of Engineering Education served a good purpose but in time lost its usefulness; this has now been revised and while it still has defects, it is one of the best guides available.

Some valuable lists have been issued by the Library of the Pratt Institute of Brooklyn, and by the Carnegie Library of Pittsburg, and good work has also been done by the American Library Association in its Booklist. In 1909, the writer compiled for the Engineering News book department two pamphlets, one on the literature of Cement and Concrete and one

on Roads and Pavements. These were not issued as 'recommended lists' of the books, but merely as descriptions, and entirely as a matter of business—to answer inquiries for information and to sell the inquirer the books he wanted. The books were not criticised, but sufficient descriptive matter regarding each was given to enable a buyer to make a selection of those best suited to meet his special requirements. Such descriptive bibliographies on various technical subjects would, no doubt, form a useful series, but they are difficult and expensive to compile, and as an advertising investment, would not repay the cost to the publisher.

The periodical book review has already been discussed. As a summary, it may be said that book reviews do not receive in many publications the attention they deserve. They are often carelessly and hurriedly written by those who have little, if any, special knowledge of the subjects, and too frequently they are written to fill a space of certain dimensions. One way of writing a review is to mention the number of pages, give dimensions of the book in inches, quote the titles of paragraphs or chapters, and state the purpose of the book according to the author's own prefatory remarks. Another way is to use more or less in its entirety, the printed write-up sent out by the publisher. Some periodicals, do, however, re-

view books fairly and intelligently, and the criticism of such periodicals is the best possible guide for the engineer in his selections. Valuable and impartial information may sometimes be obtained by students from their professors, or by engineers in general from such libraries as give attention to this class of literature. Among these are the two libraries already mentioned and the Public Library of the District of Columbia.

Selection of Technical Periodicals. The modern engineering journal is a development, resulting from the ever-expanding range of engineering activity and basing its existence on the interdependence of the various branches of the engineering profession. There are many kinds of technical periodicals just as there are of books. Unfortunately an energetic circulation and advertising policy can often make a profitable enterprise of an editorially worthless sheet; with an investment of a dollar for shears and a pot of paste, a subscription to a press-clipping bureau, and a miscellaneous assortment of exchanges, it requires only a cheap 'editor' to produce a very interesting periodical. But while there may be journals made up in this way of a hotch-potch of clippings, every technical journal of standing aims to perform a useful service to the profession and every progressive engineer must include

one or more such journals in his regular reading. These journals, on account of their unending presentation of new information may, even more than a library of books, be considered as an educational institution, but this must not be taken to mean that the reading of the technical press can be considered as a substitute for a college training.

The mass of current periodic literature offers the engineer a difficult problem in searching out those things that he wants and needs in his special line of work; first a problem of what kind of material he needs most and second, of what periodicals will give him the greatest amount of such information. His selection must be based on the field and policy of a journal as shown by its literary material. The question then arises: By what standard shall he judge this material? He would first decide upon the extent of the field he wishes to cover. So also should a public library. If it is located in a manufacturing town, it would be poor policy to spend too much of its appropriation on mining engineering papers; if it is in a mining district, it would be equally inappropriate to spend much on purely manufacturing or mechanical engineering papers. Thus, local and special requirements are easily decided upon, but in that field there may be a dozen or more periodicals; all are willing

to take a portion of the engineer's money, and according to their advertising matter, he needs them all.

Again the question arises as to a standard of judgment. The question is a difficult one, as methods of judging engineering literature have not yet been standardized, and each man must decide the question according to his own needs. With the editor of a large journal it is a very practical and every-day problem. He is called upon to pass an opinion on papers, letters, and discussions on a vast variety of engineering topics, and must adopt some standard of usefulness to the readers of his journal. A paper is not useful unless it tells something that helps the man in the field, in the shop, or in the office. This standard appears simple and self-evident, but if one could make a critical analysis of current engineering literature, measuring it all by such a standard, he would be surprised to find what a large portion of the space in some journals and society transactions is taken up with material that nobody ever used and nobody ever will or could use. This is illustrated in the purely descriptive articles and the trade write-up, already discussed, and in such vague theoretical discussions and records of experimental research that wander so far away from the practical worker that he can never make any use of the results. Mathematical theories

may be interesting to retired engineers who have time to theorize, but they are few; pages of purely descriptive matter may be interesting and entertaining, but such matter is of little technical value; the write-up article may flatter an advertiser, and incidentally bring a little money to the publisher who uses it, but it is not useful to the man in the field, in the shop, or in the office.

It is of course, difficult, if not impossible to draw a line through the various engineering specialties and to indicate on which side of this line any given periodical stands; and it is also difficult as well as inadvisable, to eliminate all general matters, for, as already stated on page 66, a representative journal of the engineering profession should endeavor to help the engineer to a larger outlook on the general affairs of the world. But the ultimate standard of value of a periodical lies in its practical usefulness to its readers and the occasional article of merely general interest should not be considered as too important in the adoption of a standard of judgment. If the engineer forms a standard of his own practical needs and adheres to that in his analysis and selection of engineering literature, he cannot go far wrong.

Quantity offers as much difficulty to the engineer in selection of his reading as quality. No man would attempt to read everything in the newspapers; he could not do it, and for his

benefit, there exists a business known as 'press-clipping'—the 'press-clipping bureau' reads thousands of papers of all kinds from all parts of the world, clips out, and supplies to its subscribers, everything on any special subjects they may be interested in. Neither could any man read all the articles on politics, art, travel, music, etc., much as he may be interested in these subjects; for his benefit are published such reviews as the 'Literary Digest,' 'Review of Reviews,' and 'Current Literature.' Similarly no man could read all the periodic literature on any one branch of engineering, and still have time for active practice. The engineer requires a wide range of information in his active work, and he wants to keep in touch with everything that is published affecting his interests, even indirectly. Only by keeping up with the times and knowing in a general way, what is going on in the engineering world, can the engineer keep up his efficiency. But such material may be published in any one of a hundred or more periodicals, and only the largest libraries could attempt to keep them all on file. To meet such a condition there are issued several more or less comprehensive indexes, such as the 'Technical Press Index' (see list on page 405), and with such an index and two or three of the best periodicals along the lines of his special interests, selected on a basis of quality, an engineer with a small in-

come can obtain a good service of periodicals at a very low cost.

But while books, periodicals, and society proceedings constitute the most useful and necessary forms of literature for engineers, they do not, by any means, cover the whole field. There are not only vast quantities of new books and hundreds of weekly and monthly periodicals being poured out by the various publishing houses and technical societies, but there are also thousands of publications being issued annually by manufacturing concerns and by the Government. Many of these trade publications contain matter of practical value to engineers, which cannot be found elsewhere in technical literature, and the engineer who does not aim to keep a properly cared-for file of current catalogues in connection with his specialties is likely to be mortified by finding himself ignorant of some technical matter which the commercial man will have at his fingers' ends.

Government Publications and How They May be Obtained.* There are no doubt many people who do not realize that the United States Government has at Washington in the Government Printing Office one of the largest printing and publishing establishments in the world. Still less is it generally known that

*Abstracted from "Engineering News," July 18, 1907.

it is constantly bringing out valuable scientific works compiled by experts and specialists in every department of science, in the direct employ of the Government and out of it. The law provides that all of these publications be obtainable by anyone free or at the actual cost of printing and binding, if they are not out of print. The only difficulty is to know to whom to apply for information concerning them.

Previous to 1892, the system was in general confusion and it was possible to obtain any book direct from the department publishing it, simply on request. But by the general printing act of that year the office of Superintendent of Documents was created in connection with the Government Printing Office and since that time the distribution of Government documents has become very much more systematized.

This office has become the depository for a valuable collection of Government publications, dating back to the early days of the republic. The total number of volumes under its care now numbers several millions, of which close to a million are assorted, forming the sales stock, and covering nearly every important department, bureau, and series. Many rare books are included, but according to the law all must be sold 'at cost,' regardless of

their age and scarcity. Of many of the most valuable works only one or two copies remain.

It is the policy of the office to facilitate as far as possible the distribution of the publications prepared at great expense by the Government. For this reason, the Superintendent of Documents will upon request furnish any information regarding public documents, as to how and where they may be obtained and, if they are on sale, at what price. In answering such inquiries great care is taken to supply full and accurate information.

The office is intended as a great clearing house for Government publications. It carries on an enormous exchange business with libraries and educational institutions and in this way, hundreds of libraries have been supplied with publications greatly needed in their respective localities in exchange for those which are either duplicates or of no service to them.

There are a few very simple restrictions in the purchase of documents. The office supplies no documents free of charge nor can they be forwarded in advance of payment. Money must be sent by money postal order, express order, or New York draft; stamps and uncertified checks are not received. As has been said, the Superintendent of Documents can supply information regarding all Government documents, and can furnish all such as are

in his care. Some, however, are distributed direct by the departments, and in such cases, with some exceptions, can be obtained free. Each department issues gratis a price list of its publications, which can be obtained upon application.

To particularize: The Geological Survey probably publishes more matter of interest to the engineering world than any other department of the Government. Most of its larger publications, such as the annual reports, monographs, water supply and irrigation papers, reports on mineral resources, etc., are distributed through the office of the Superintendent of Documents. All the publications of the Survey, except monographs, atlases, and atlas sheets may be obtained free of cost by writing to the Director of the Geological Survey. The free publications include the useful series known as 'Water Supply and Irrigation' papers. The geologic folios, of which many have been prepared, embracing sections from many states of the Union, are on sale by the Director of the Survey, at prices ranging from the standard price of 25 cents up to \$11 each, with discounts on large orders. In the same way, the topographical sheets which are prepared in connection with the folios and as a basis for them, are sold at the rate of 5 cents each, or \$3 per hundred sheets.

All publications of the Department of Ag-

riculture and of the Smithsonian Institute are supplied through the Superintendent of Documents; the Weather Bureau, the Bureau of American Republics, and the Office of Public Roads sell their own publications. Those of the Navy Department, Department of Commerce and Labor, and the Civil Service Commission are supplied free on application.

No general catalogue of U. S. Public Documents exists, but the Superintendent of Documents has within the last few years issued a monthly catalogue of documents published during each month, both those under his own charge and those distributed by the separate departments. This can be obtained at the annual subscription price of \$1.10. and is of great assistance in keeping up with Government publications. Separate price-lists on special subjects are also prepared from time to time and are free.

It is frequently possible also, for one to obtain documents, especially current Congressional documents, free on application to his Senator or Congressman, as the law allots to each a certain number of copies of each document as it appears.

READING AND JUDGMENT OF ENGINEERING LITERATURE

essary to the successful practice of engineering
Periodicals. That extensive reading is nec-

is acknowledged, but right and wrong habits of reading can as readily be formed in connection with engineering literature as with newspapers and fiction. The question of how a reader may make best use of current engineering literature, was discussed in an editorial in 'Engineering News' (Nov. 17, 1910), in which the writer points out the necessity for the engineer of to-day to be able to find in his published literature the knowledge he requires and to be able to read such literature understandingly and to form a correct judgment as to its reliability and its bearing on his own problems. It is the acquirement of this ability that gives the college-trained engineer a large advantage over many of the engineers who have learned their profession in the school of practical experience.

In his reading of the current periodicals and publications of societies, the engineer can find some encouragement in the fact that much which is printed is not of permanent value and may be merely glanced at or passed over entirely. Further, much of the data soon finds its way into published text-books and the engineer will do well to follow these. But the text-books are usually from one to five years behind the state of the art which they profess to cover; moreover, there is considerable matter in the periodicals which is omitted or overlooked by the text-book writers, so it is not a

safe plan to rely on these books alone. An engineer should know, first, how to quickly turn to his own reference library for information on any particular subject, and second, how to search in larger libraries for data which his own library may not contain. In other words, he should first have his own reference library indexed, and second he should know how to use the published indexes to engineering literature in general, such as those listed on page 405.

The latter task has already been referred to; here we will speak of the first — keeping one's own card index to the special articles most likely to be of direct use, and to the books, reports, or other publications which one may notice from time to time as especially desirable for reference. Not only is this card index, properly kept, a most useful tool, but the work of keeping the index is a most beneficial exercise to a young engineer in cultivating system in his professional reading and a critical faculty in his study of engineering papers.

In reading any publication, find the articles of most use and read them thoroughly. Then fill up one or more reference cards to each article; a few moments thus spent may save as many hours of fruitless search for information whose location has been forgotten. File the cards systematically under such headings

as may seem most fit. Each card should, of course, show the subject of the article; the author's name, with notes as to whether illustrated or not; the approximate length; the name of the book or paper, and the page number and date of issue. It will save much time to have the index cards printed, with blanks for these several items, to economize time in filling out the cards.

Do not attempt too elaborate a classification. Where the index is primarily for one's own use, many short-cuts and time-saving abbreviations are allowable. It will not generally be necessary to make more than one card for an article, if the article is classified under the subject through which it appeals most, and which is most likely to be thought of in connection with it. Do not try to index too many articles; choose those in the fields of special interest and those which contain matter of permanent value. Cultivate the habit of critical analysis of engineering literature; such analysis will be a mental tonic. One should not be discouraged if his index grows slowly, provided it grows steadily; some day it will form a valuable business asset. Do not confine the indexing to articles in periodicals and society publications; note should be made of any important book, or the review of such a book, or perhaps of a particular chapter in a book.

It is often best to index an article under

some other head than its title, for the title is often chosen rather to attract the reader's attention than to accurately show what the article is about. All items should receive attention; sometimes a paragraph or two in the editorial columns or in letters conveys more important information than an article of several pages devoted to description.

All papers should be indexed, for even if a reader cannot file the copies of all those to which he subscribes he can perhaps refer to the bound volumes of some engineering reference library. Some engineers cut out articles on certain subjects and file them on some system or other, which may serve well for a limited range of subjects, but such files rapidly grow bulky if too much is attempted. It must be remembered that any such file of clippings and the card index should be supplementary to the published indexes of the journal. The reader should rely on the published indexes for general access to both private and public libraries; and keep the individual index for matter of such special interest as must be covered in greater detail than is possible in the published indexes.

It is probable that most of the subscribers of technical periodicals preserve and bind their copies, at least of their most helpful journals. Perhaps if a man were absolutely sure he would follow a particular specialty all his life

long and would never have need for information on any other department of engineering work, the clipping out and filing of articles would be a good course to pursue; but very few engineers can map out their future in that way. Some years ago, for example, thousands of engineers were devoting all their attention to steam railway construction. Today nine-tenths of them are in other fields of engineering work, as reinforced concrete, hydro-electric development, electricity, etc., and it is quite safe to say that those fared the best in making the change who were best equipped for these other lines of work and who had kept in touch with them as far as possible during their work on railway construction. It is well, therefore, that readers, in their own interests, preserve and bind their copies. The time will surely come when the information they can find in those pages, on other departments of engineering than that on which they may be at any one time engaged, will be of the greatest value to them.

How to Read Books. In the multitude of books written for technical men, some are so poorly written and so useless in their material that they are hardly worthy of consideration at all; others, on account of incompleteness, have but a limited usefulness, and from this they range upward in quality to the standard and reliable treatises. The majority of these

are expensive and as there is no more economy in buying useless books than in paying for useless power, some method should be used in forming a judgment as to whether or not the purchase and reading of a certain book would be money and time well spent. It is not well to purchase books immediately on the announcement of publication unless there is such need for the work that any information is better than none. If there is no present use for the book, it is better to make a note of it from the notice or advertisement; later, when the book is needed or when you have time and inclination to read it, buy it. In that way your library will always contain the latest editions. Reviews of all books on subjects of interest should be read and noted and if the opinions formed from the reviews be recorded with the note, they will later greatly assist in judging as to what books you ought to buy.

In reading a technical book, or in fact, a book of importance of any kind, it should first be looked over in a general manner to learn something of its plan, scope, arrangement, and limitations. For this purpose, first read the Preface and Table of Contents, then go through it, reading the captions, or sub-heads, and noting how fully each topic is treated. This will not only better fit you to give the book its first reading, but will make easier the further reading of it, as well as the understand-

ing of what the author aims to teach. In a complete and thorough reading it is well to mark what is new, and later review those chapters, pages, or paragraphs, for unless a reader has a most uncommon and retentive memory, such a review will be necessary to obtain the greatest benefit from his study.

Generally it is a waste of time to study the detail of mathematical problems for which there is no present use, because it is quite likely that, by the time you need to apply them to practical work, the solution will be forgotten and the study will have to be repeated. It is better to read the mathematical and highly technical parts only in a way to get a general idea of the treatment, the scope, and the soundness of the analysis. When occasion comes to use this information, turn to it and study it in detail.

In reading a technical book the object is not entertainment or merely to know the opinions of the author, but rather to improve one's own knowledge of the subject treated, but it is not necessary for the reader, especially if he already knows much about the subject, to adopt any particular writer's opinions as absolutely correct. He should, from his own experience, consider whether the opinions expressed are right or not, and to that end he would do well to compare them with his own by noting either in the margin of the book or in a note book,

his criticisms of faults or defects, and comments on points of difference in practice. For instance, where the treatment is confused and obscure, systematize and improve it; where it is imperfect, supply the deficiencies; where it is too brief and concise, amplify a little; where it is redundant, eliminate and condense; where important statements are quoted, observe the sources of authority; where there is argument, note whether it is consistent; if the conclusion be true, but the argument weak, confirm it by stronger proofs; where propositions are inferred, look for the justice of the inferences; where you suppose a mistake is made, consider your own objections, prove the error and correct it; what you approve of as well written, correct, and useful information, secure in your memory or note it where it will be accessible when wanted.

If the method of treatment be irregular, reduce it into form by a brief analysis of your own; if things are heaped together which should be separated, distinguish and separate them by your own reference system; if items relating to the same subject are too much scattered throughout the treatise, bring them together by references; if the book has no index, or a good table of contents, make one as you are reading it, not necessarily as complete and exact as if it was designed to be printed, but noting all those parts which are new to you,

or which you think you may have further use for. If certain portions of the book are specially valuable, they may be reconstructed or abridged into a lesser form, for your own personal use. If the writer of the book be known for any peculiar excellencies or defects in his style or manner of writing, observe this also, and mark any new words, idioms, or unusual expressions that may occur in his language.

All this work will tend to cultivate habits of methodical study, to improve the reader's judgment in general, and to give him a more complete knowledge of that subject in particular; and in later years after he has studied a few valuable books on any special subject in this manner, it will be easy to read others, because he will find less and less new matter in them. It will also help in improving his powers of expression by extending his command and understanding of technical terms. One good book read over in this manner, with all the laborious thought and writing involved, will add more to the reader's solid knowledge than the skimming over the surface of a whole library of books. A man may read voluminously and with diligence, and may find much pleasure in his reading, just as he might in hearing a story told, but still fail to advance in learning, because his reading leaves no impression on his mind. If he makes no observa-

tions on what he reads and draws no inferences from it; if he crams himself with undigested formulas and facts, or if he lets his eye merely slide over the pages without thought, the ideas will quickly slide out of his mind and vanish like the shadow of a cloud on a summer's day. The reader should, therefore, enter into and understand the sense of what he reads, and by judging of its value for himself from the authorities and proofs presented, he will rapidly increase his store of knowledge, and will acquire also the habit of judging correctly and of reasoning well, in imitation of the best writers whose works he studies.

Judgment of Books. One should not commence the reading of any new book with a prejudice either for or against it or with a settled resolution to believe or disbelieve, to confirm or to oppose, what it teaches, but should always read with the object of laying the mind open to new facts. It is not the subject which forms the basis of judgment of a book, but how the writer treats that subject. In considering a book which we have not seen before, the first thing that offers is the title page, and from this we may sometimes get a fair idea of the scope of the work, though most titles are designed to attract attention to the book rather than to describe its contents. The author's name, if it be well known, will help in forming an opinion of the general char-

acter of the work. A perusal of the Preface or the Introduction and of the Table of Contents or Index, may further assist our judgment. The first reading of the book, by titles and chapters with perhaps several particular chapters or sections, will show whether there is anything valuable or important in them; whether the author is clear, strong, and methodical; whether he is obscure and confused; and finally, whether the matter itself may be solid and substantial, though the style and arrangement may not be good.

From this cursory examination, we can generally judge whether the treatise is worth a complete perusal or not. But if such a survey is wholly unsatisfactory we may as well lay aside the book at once, for there is a great probability that it is of a very indifferent character, and life is too short and time too precious to read any new book thoroughly, only to find that it is really not worth reading at all.

In passing judgment on books there are a few general mistakes which persons are frequently guilty of. One is the passing of a favorable judgment on a treatise which agrees with their own principles and supports their own opinions, but which on the whole may be very mediocre and poorly written. On the other hand, if the writer teaches different opinions and contrary principles, such persons can usu-

ally find neither good sense nor good language in it.

A mistake to which young engineers especially are liable to fall into is; when they read a treatise on a subject with which they have but a slight acquaintance and find almost everything new to them they commend the book itself and agree with the author at once, whereas a man better posted on that subject might find that the author had written poorly, that many of his statements were incorrect, and that the book had nothing of real value in it. But on the other hand, there is a possibility of a mistaken judgment on the part of the man with an extensive knowledge of the subject. An engineer who is a master of a particular specialty, who has studied and practiced it long and on all sides, might find scarcely any writer on that subject who can give him any new information, and on that account he may condemn a book, which in its treatment is sound, clear, and comprehensive.

Thus the student and the engineer, both young and old, may have their several distinct difficulties, dangers, and prejudices in their judgment of the writings of other men. Those mentioned are but examples, for the prejudices that may warp the judgment, aside from the quality of the book itself, are almost infinite and endless. For instance, one of the greatest sources of prejudice, and one which, unfortu-

nately, has shown itself among technical men, is a secret vanity, pride, or envy, on account of which one man may severely censure a valuable book written by another man on some subject on which he himself has written, or on which he considers himself an authority. Such a writer may throw contempt by wholesale upon the writings of others, basing his judgment on some trivial mistake, or on some few sentiments or expressions of opinion not in accord with his own, or on some slight blemish in the method of treatment at which he can nibble and bark. But when a book possesses good qualities, and teaches valuable lessons, these little critics should not exalt themselves and pour out a volume of spite and ill-nature upon it, but rather stretch their powers of consideration until they produce a work superior to the one which they condemn.

In conclusion, it may not be amiss to quote from some of the standard authors, a few short passages regarding the use and abuse of books in general, which have been selected as specially adaptable to the class of books under present consideration:

Frederick Harrison: The longest life, the greatest industry, joined to the most powerful memory, would not suffice to make us profit from the hundredth part of the world of books before us.

For myself, I am inclined to think the most useful help to reading is to know what we

should not read, what we can keep out from that small cleared spot in the overgrown jungle of 'information,' the corner which we can call our ordered patch of fruit-bearing knowledge.

Those who are on good terms with the first author they meet, run as much risk as men who surrender their time to the first passer in the street; for to be open to every book is for the most part to gain as little as possible from any. A man aimlessly wandering about in a crowded city is of all men the most lonely; so he who takes up only the books he 'comes across' is pretty certain to meet but few that are worth knowing.

When our reading, however deep, runs wholly into 'pockets,' and exhausts itself in the literature of one age, one country, one type, then we may be sure that it is tending to narrow or deform our minds.

Thomas Carlyle: We have not read an author till we have seen his object, whatever it be, as he saw it. Is it a matter of reasoning, and has he reasoned stupidly and falsely? We should understand the circumstances which, to his mind, made it seem true, or persuaded him to write it, knowing that it was not so.

I do not know whether it has been sufficiently brought home to you that there are two kinds of books. When a man is reading on any subject, in any department of literature—in all books—he will find that there is a division into good books and bad books. Everywhere a good kind of book and a bad kind of book. I am not to assume that you are unacquainted or ill-acquainted with this plain fact; but I may remind you that it is becoming a very important consideration in our day.

Isaac D'Israeli: To read every book would be fatal to the interests of most readers, but it is not always necessary in the pursuits of learning, to read every book entire. Of many books it is sufficient to seize the plan, and to examine some of their portions. Of the little supplement at the close of the volume, few readers conceive the utility; but some of the most eminent writers have been great adepts in the art of Index-reading. I, for my part, venerate the inventor of Indexes.

Ralph Waldo Emerson: The best rule for reading will be a method from nature, and not a mechanical one of hours and pages. It holds each student to a pursuit of his native aim instead of a desultory miscellany. Let him read what is proper to him and not waste his memory on a crowd of mediocrities.

Nature is always our friend in this matter. Nature is always clarifying her water and her wine. No filtration could be so perfect. She does the same thing by books as by her gases and her plants. There is always a selection in writers, and then a selection from the selection. In the first place, all books that get fairly into the vital air of the world were written by the successful class, by the affirming and advancing class, who utter what tens of thousands feel but cannot say. There has already been a scrutiny and choice from many hundreds of young pens before the book * * * which you read * * * comes to your eye.

Julius Charles Hare: The difference between desultory reading and a course of study may be illustrated by comparing the former with

a number of mirrors set in a straight line, so that every one of them reflects a different object; the latter to the same mirrors so skillfully arranged as to perpetuate one set of objects in an endless series of reflections.

If we read two books on the same subject, the second leads us to review the statements and arguments of the first; the errors of which are little likely to escape this kind of proving, while the truths are more strongly imprinted on the memory, not merely by repetition, but by the deepened conviction thus wrought in the mind, of their being verily and indeed truths.

Desultory reading is indeed very mischievous in fostering habits of loose, discontinuous thought, by turning the memory into a common sewer for rubbish of all sorts to float through, and by relaxing the power of attention, which of all our faculties needs most care, and is most improved by it. But a well-regulated course of study will no more weaken the mind than hard exercise will weaken the body; nor will a strong understanding be weighted down by its knowledge, any more than an oak by its leaves, or than Samson was by his locks.

John Morley: I will not take up your time by explaining the various mechanical contrivances and aids to successful study. They are not to be despised by those who would extract the most from books. Many people think of knowledge as of money. They would like knowledge but cannot face the perseverance and self-denial that go to the acquisition of it. The wise student will do most of his reading

with a pen or pencil in his hand. He will not shrink from the useful toil of making abstracts and summaries of what he is reading.

James Russell Lowell: There is a choice in books as there is a choice in friends, and the mind sinks or rises to the level of its habitual society, or is subdued to what it works in.

Read such books as make us think, and read them in such a way as to help them do so, that is by endeavoring to judge them, and thus to make them an exercise rather than a relaxation of mind. Desultory reading, except as a conscious pastime, hebetates the brain and slackens the bow-string of will. It communicates as little intelligence as the messages that run along a telegraph wire do to the birds that perch on it. A man is known by the company he keeps and not only so, but he is made by it.

XXII

LIST OF TECHNICAL INDEXES

American Journal of Science, m.—6.00

"Scientific Intelligence" contains book reviews and abstracts of periodical literature and federal and state publications, classified as chemistry, geology, and miscellaneous.

Amer. Soc. of Civil Engineers (Proc.), m.—8.00

"Monthly List of Recent Engineering Articles of Interest" classifies under the main branches of engineering the contents of about 100 periodicals, one-fifth of which are French and German. Titles only given. Illustrations are noted but neither length nor value of articles are given. Journals are referred to by a system of numbers instead of by name, thus making reference difficult. Printed on one side only.

Chemical Engineer, Chicago, m.—2.00

"Index of Articles on Applied Chemistry"; indexes about 75 journals, about one-third being foreign. Selects only articles of interest to the chemical engineer. Gives descriptive of evaluative note on each article. Titles of articles in foreign languages are translated. Printed on pages backed by advertisements.

Electrical World, New York, m.—3.00

"Digest of Current Electrical Literature" contains good abstracts of important articles appearing in the electrical periodical press of the world, frequently several hundred words in length. Foreign articles abstracted in English.

Abstracted from Monthly Bulletin (June, 1910) of the Carnegie Library of Pittsburgh. This list is not intended to be complete; it is merely intended as a guide to the more important indexes and bibliographies of current technical literature, which are of value to writers on engineering subjects.

Engineering-Contracting, Chicago, w.—2.00

"Monthly Review Index of Civil Engineering Literature" classifies articles in about 100 journals, nearly all in English. The literature indexed relates solely to Civil Engineering.

Engineering Magazine, New York, m.—3.00

"Engineering Index" indexes the contents of about 200 periodicals, mainly English, French, and German. Gives length of article and descriptive note and indicates illustrations. Classified under Civil, Electrical, Mechanical, Marine and Naval, and Railway Engineering, Mining and Metallurgy, Industrial Economy, Street and Electric Railways.

Eng'g. and Min'g. Journal, New York, w.—5.00

"Mining Index" contains a classified bibliography of the current literature of mining and metallurgy, giving author, length of article and occasional brief notes.

Illuminating Engineer, New York, m.—2.00

"Proceedings of Technical Societies" and *"Review of the Technical Press"* gives reviews of books and an index with many abstracts of journal articles on illumination and photometry, electric lighting, gas, oil, and acetylene lighting.

Industrial Engineering and The Engineering Digest, New York, m.—2.00

"Technical Press Index" indexes contents of 170 American and Canadian and 74 foreign journals. Gives length of article, number of illustrations, price at which article can be supplied and where necessary a descriptive note summarizing the articles. Classified under Architecture, Automobiles and Aerial Navigation, Civil, Electrical, Marine, Mechanical, Mining, Municipal, and Railroad Engineering, Economics and Education, Industrial Technology, and Metallurgy; each classification is further subdivided into sections.

Metallurgical and Chem. Eng'g., m.—2.00

"Synopsis of Metallurgical and Chemical Literature" gives lengthy and well-prepared abstracts of selected articles.

Mining Science, Denver, w.—3.00

"Current Articles from the Technical Press" gives brief abstracts of selected articles on geology, mining, and metallurgy. Only about 20 articles are given weekly, and titles of journals are very abbreviated. Chief value is in timeliness.

Munic. Journal and Engr., New York, w.—3.00

"Municipal Index," appearing in second issue of each month, lists and classifies under a few broad subjects, all articles treating of municipal topics appearing in the leading periodicals. Gives author, length of article, and an explanatory note where necessary. Includes some books and many municipal and health board reports not indexed elsewhere.



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